CORRELATION BETWEEN CENTRAL CORNEAL THICKNESS (CCT) AND RETINAL NERVE FIBER LAYER (RNFL) ANALYSIS OBTAINED BY SCANNING LASER POLARIMETRY (GDX VCC) IN PRIMARY OPEN ANGLE GLAUCOMA PATIENTS (POAG) AND POAG SUSPECTS.

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CERTIFICATE

Certified that this dissertation entitled "**CORRELATION BETWEEN CENTRAL CORNEAL THICKNESS (CCT) AND RETINAL NERVE FIBER LAYER (RNFL) ANALYSIS OBTAINED BY SCANNING LASER POLARIMETRY (GDX VCC) IN PRIMARY OPEN ANGLE GLAUCOMA PATIENTS (POAG) AND POAG SUSPECTS."** submitted for the Master of Surgery (Branch III) Ophthalmology, is a bonafide work done by **Dr.T.Anusha Priyadarshini** under our supervision and guidance in the Department of Glaucoma Services of Aravind Eye Hospital and Postgraduate Institute of Ophthalmology, Madurai during her residency period from May 2010 to April 2013.

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ANNEXURE

INTRODUCTION

Glaucoma is a major cause of irreversible blindness worldwide.[1-9] According to World Health Organisation statistics,about 13.5 percent of global blindness is due to glaucoma,causing blindness in more than 5.1 million people. There occurs variation in glaucoma prevalence among different race groups and regions. Open-angle glaucoma is more common among persons of West African origin [5]and angle-closure glaucoma is more common among EastAsian population [9].

Only limited number of studies are available regarding the prevalence of glaucoma in our country and its associated risk factors. A study done in south Indian population estimated the prevalence of any glaucoma to be 2.6% and of primary open angle glaucoma 1.7% .[11]

Patients are usually not aware of glaucoma in early stages because it is an asymptomatic disease.Visual field defects are detected by standard automated perimetry only when around thirty to fifty percent of retinal ganglion cell axons are lost [12-15] and clinical diagnosis of glaucoma is made only when significant amount of Retinal Nerve Fiber Layer damage has already occurred.[16-19] Therefore more sensitive diagnostic modalities should be employed for early diagnosis of glaucoma which is critical in preventing irreversible loss of vision .

Early evidence of glaucoma can be detected by clinically evaluating the optic nerve head and Retinal Nerve Fiber Layer [20-22].However it is subjective and there is a high variability ,making diagnosis of early glaucomatous damage challenging.Structural charecteristics of the optic nerve head and RNFL are measured using newer techniques like Scanning laser polarimetry commercially known as GDx-VCC, Optical coherence tomography and Confocal scanning laser ophthalmoscopy. [23]

Primary open angle glaucoma (POAG) which is considered as the most common type of glaucoma, is charecterised by the presence of glaucomatous optic neuropathy in the absence of any identifiable secondary cause .There are various causal,non causal or associated risk factors enumerated in the pathogenesis of glaucoma.Among them elevated intraocular pressure is the only major risk factor which is both causal and modifiable .However in recent studies, Central Corneal Thickness (CCT) has been put forward as an important risk factor for development and severity of POAG [24-26]. In about 15 percent glaucoma patients management strategy is directly affected by CCT measurement [27].

The Ocular Hypertension Treatment study regarded Central Corneal Thickness to be the most important risk factor for conversion from ocular hypertension (OHT) to open-angle glaucoma. Thin corneas are related with

increased risk of glaucoma among ocular hypertensives[28] .Though underestimation of IOP due to thin CCT is implicated,the thinner corneas have lesser connective tissue support in the optic nerve which makes it more susceptible to elevated intra ocular pressure.

It is a well known fact that the regional variations in the structure of Lamina cribrosa matches the pattern of early glaucomatous damage.It is likely that elevated intra ocular pressure acts initially to cause physical distortion in Lamina, greatest at vertical poles, that result in the selectively greater damage to axons passing through these zones.So it can be inferred that apart from raised intraocular pressure, laminar properties are also responsible for characteristic glaucomatous damage to optic nerve.[29,30]

Considering the eye to be an enclosed corneoscleral –laminar shell,with cornea and lamina at either pole,this lays an anatomical correspondence between these structures and due to this anatomical correspondence the similar biomechanical stress is borne by these two tissues.These structures are also related embryologically which is discussed in forthcoming chapter.

Considering the above facts, this observational cross sectional study is conducted to determine the association between central corneal thickness and retinal nerve fiber layer thickness as measured by scanning laser

polarimetry.Correlation of CCT with age ,intra ocular pressure,vertical cup disc ratio were also studied.

DEVELOPMENTAL ASSOCIATION

OF CORNEA,SCLERA AND LAMINA CRIBROSA.

The Cornea, sclera and lamina have an embryonic association among them. They all contain mesenchymal element of neural crest cell origin, which are found along the margins of the optic cup.These cells migrate beneath the basal lamina of corneal epithelium and form primodial endothelium.Along with differentiation of anterior chamber , three successive ingrowth of neural crest cells occurs [31]

- First wave → Corneal endothelium.
- Second wave → Iris and pupillary membrane.
- Third wave → Keratocytes.

The corneal stroma is formed by in growth of mesenchymal cells into the space between corneal epithelium and endothelium and these mesenchymal cells differentiate into stromal fibroblast or keratocytes that will actively secrete type -1 collagen and matrix of the mature corneal stroma.Corneal endothelium and descements membrane are formed by primodial endothelium and its basal lamina respectively. In postnatal life, homogeneous fibrillogranular material (posterior nonbanded zone) which constitutes descement membrane continue to increase in thickness with age [31].

Sclera is developed by similar set of mesenchymal cells which give rise to corneal stroma. The scleral fibroblasts forms the extra cellular matrix,dermatan sulphate and chondroitin sulphate .

Preliminary lamina cribrosa is formed by the undifferentiated sclera – derived from mesenchymal cells which migrate between glia covered ganglion cell axons of optic nerve and become oriented transeversely to synthesize lamina cribrosa.

Though the cornea and lamina cribrosa are formed from mesenchymal cells ,their anatomical development and structural protein content varies which is discussed below.

DEVELOPMENTAL DISSIMILARITY BETWEEN CORNEA AND LAMINA CRIBROSA.

The corneal stroma and endothelium starts developing by four to six weeks of gestation by immigration of neural crest cells.During eighth week of gestation,lamina scleralis will be formed initially in the region of primitive optic nerve head. The ganglion cell axons gets scaffolding by the invasion of the glial cells from the outer wall of the optic stalk [32].

The mesenchymal part of the lamina cribrosa and connective tissue fibers are formed by the ingrowth of cells derived from sclera in the fourth month.The lamina cribrosa gets vascularisation by thirteenth to fourteenth weeks, and fully developed by seventh month. During the developmentof lamina cribrosa the ganglion cell axons and the hyaloid vessels forms the content of the forthcoming lamina cribrosa pores .The development of trabecula of lamina cribrosa takes place in two steps. A provisional net is formed by the glial cells of the outer optic stalk wall which is stabilised and strengthened later by ingrowth of sclera drived mesenchymal cells .

Thus,the vascularised scleral connective tissue penetrates the glial lamina, hyaloid vessels and the ganglion cell axons and finally forms the mature lamina cribrosa.

During the embroyonic stage ,the lamina cribrosa undergoes continuous remodelling due to the loss of two thirds of the initially developed retinal ganglion cell axons .

Composition of the adult cornea and lamina cribrosa

Structural Components of the Adult Cornea .

- Collagens in Adult Cornea

Fibrous collagen types I,II,III,V

Non fibrous collagen IV

Filamentous collagen types VI,VIII,IX, and XI

- Glycosaminoglycans

Keratan sulphate 50%

Chondroitin sulphate A 25 %

Chondroitin 25 % -Present exclusively in cornea.

Structural Components of Lamina Cribrosa

The porous region of the sclera that is formed by specialized extracellular matrix ,consists of fenestrated sheets of connective tissue and rarely elastic fibers lined by astrocytes . Astrocytes may respond to changes in IOP in glaucoma, leading to axonal loss and RGC degeneration at the level of lamina cribrosa[33] .

There are series of three to ten connective tissue sheaths in which the cribroform plates alternates with a series of glial sheaths in lamellar fashion.

The pores which admit the axonal bundles are not of uniform size across the lamina. Largest pores are noted superiorly and inferiorly implying that there is less structural support for the nerve bundles in this region.But the distribution of supportive glial and connective tissue differ among individuals[32].

There is a greater tissue density circumferentially than axially. It is denser nasally than temporally in the horizontal meridian.**Quigley et al** [34] suggested that in POAG ,the location of early backword bowing and collapse of the sheath of lamina is determined by the regional variations in the density of supportive tissue.

According to **Hernandez et al** [35] that the cribriform plates consists of core of elastin fibers along with type III collagen fibrils and in turn coated by type IV collagen and laminin.The mRNA for type IV collagen is expressed by astroglial cells as well as by cells within the connective tissue plates,in the glial column,pial septa, and vessel walls.But mRNA for collagen types I and III are expressed only by cells of the cribriform plates in the adult human lamina cribrosa.

The similarities and dissimilarities in the structure of cornea and lamina cribrosa has questioned the assumption that thinner corneas are directly related to weaker lamina cribrosa.

According to a histomorphometric study by **Jost B. Jonas et al** [29] there was no significant anatomical relationship between lamina cribrosa thickness and central corneal thickness though a clinically assumed relationship exists between CCT and glaucoma susceptibility .

WHY THINNER CORNEAS ARE ATTRIBUTED TO SEVERE PRIMARY OPEN ANGLE GLAUCOMA.

There exists a possible biological link between central corneal thickness and the structure and deformability of the optic disc, lamina cibrosa, and peripapillary sclera, thereby increasing the susceptibility to glaucoma .

According to the Ocular Hypertension Treatment Study the properties of the ocular coats of the eye may be an underlying causal factor for glaucoma susceptibility.[36]

Henderson et al [37] demonstrated thinner CCT correlating with thinner RNFL measurements in OHT patients The movement of lamina cibrosa using confocal scanning laser opthalmoscopy after profound IOP

lowering was measured by **Leske et al** [38] .The significant forward movement of lamina was noted in thinner corneas than those with thicker corneas.

Pakravan et al [39] demonstrated a link between disc size and corneal thickness.Small optic disc was correlated with thick corneas .Cenrtal corneal thickness is one among the heritable aspects of ocular structure and this was proved by **Toh et al.** [40]

The Lamina cribrosa which acts as a pressure barrier between the intraocular space and the cerebrospinal fluid (CSF) space is markedly thinner in patients with advanced glaucomatous optic nerve damage than those in early stage of the disease [41].Also high myopes have thinner lamina cribrosa than moderate myopes, accounting for increased susceptibility to glaucoma [42] .

Both inaccuracies in measured intra ocular pressure and additional factors like the properties of the lamina cribrosa and posterior sclera accounts for increased severity of glaucoma in patients with thinner corneas. The hydrostatic pressure environment surrounding the lamina is important for axoplasmic flow in the ganglion cells axons and its survival .The thickness of the lamina ,intraocular pressure, and retrolaminar tissue pressure determines the pressure gradient across the lamina cribrosa.

The effect of extended IOP in primate eyes was studied by **Quigley et al** [34] and was concluded that the amount of damage to the axons is directly propotional to the duration of elevated IOP and the amount of elevation. In eyes with IOP elevation lasting more one week, anterior disc nerve fiber were lost along with lateral and posterior movement of lamina cribrosa led to optic disc cupping with more damage to superior and inferior fibers .

Later he deduced that the more deformable lamina cribrosa at superior and inferior pole is due to the large pore size and less connective tissue support at the two poles.This correlates significantly with typical glaucomatous damage.The elevated IOP caused outward bowing of these two poles causing more deformity of the nerve fiber bundles and stopping axoplasmic flow. It shows that weaker regions of lamina are more prone for glaucomatous damage and elevated IOP is responsible for this effect.

DEFINITION OF PRIMARY OPEN ANGLE GLAUCOMA.

A glaucomatous optic neuropathy in the eyes with open angle in the absence of history of / or signs of secondary glaucoma ,characteristed by glaucomatous changes based on 97.5 percentile for this population along with glaucomatous visual field loss.[43, 44,45]

Primary open-angle glaucoma (POAG) is typically defined by following three criteria.

1.Intra ocular pressure typically above 21mmHg in atleast one eye.

2.Open anterior chamber angles with no apparent ocular or systemic abnormality accounting for the elevated intraocular pressure.

3.Typical optic nerve head damage and /or glaucomatous visual field damage.

The cut off point of intraocular pressure of 21mmHg is primarily used only for screening purpose.

RISK FACTORS

Intraocular pressure [5,44,46]

IOP is considered as the most important known risk factor for POAG development.The normal value ranges from 10–21 mmHg, with a mean of 16 mm Hg.It is the interaction between the absolute intraocular pressure and the the optic nerve sensitivity to elevated pressure that causes optic disc changes and visual field loss .

Increasing Age [2,5,11]

Male sex [8,47]

Black Race [7,48]

Refractive error-Myopia [11,49]

Heredity [50-52]

POAG seems to be inherited as a complex trait that does not follow simple mendelian inheritance. About 11 loci are identified with three genes namely myocilin,optineurin and WDR36.According to the Rotterdam study relatives of POAG patients were ten times more likely to develop glaucoma[8].

.Systemic factors

The Baltimore Eye Survey concluded that diabetes and POAG were not related [5] . The Rotterdam study [8] and Blue Mountains Eye Study[53] suggested a possible association between diabetes and POAG.The Aravind comprehensive eye survey did not find any association in south Indian population[11].

Central Corneal thickness

A thinner cornea is an important risk factor for the development of open-angle glaucoma in an ocular hypertensive patient and also a possible risk factor and marker for predicting advanced glaucoma . The Ocular Hypertension Treatment study , suggested that the increased risk related to

thinner corneas was not due to IOP underestimation alone,but also due to lesser connective tissue support in the optic nerve of thin cornea patients making them more susceptible to pressure-induced and vascular damage[36].

Central corneal thickness significantly influences on intraocular pressure measurements with Goldmann applanation tonometry[54-57].It is overestimated in thick corneas and underestimated in thin corneas. As the range of underestimation and overestimation covers around 12 mm Hg, the corneal thickness may affect IOP values to a significant level.The CCT has been found to be higher in ocular hypertensive subjects compared with and patients with glaucoma and normal subjects. Many patients classified as having ocular hypertension may actually had thick corneas that led to an overestimation of a normal, true IOP [58] .

CCT is considered to reflect changes in the sclera and lamina cribrosa due to the fact that cornea, sclera, and optic disc lamina are continuous anatomically[58].

PATHOPHYSIOLOGY OF GLAUCOMATOUS DAMAGE OF OPTIC NERVE

Site of injury of ganglion cells

The final outcome of all pathogenetic mechanisms causing POAG is the retinal ganglion cell death.There is consensus that the optic nerve head itself especially the laminar ONH is a primary site of glaucomatous axonal injury[59,60].

Histologically disruption of orthograde and retrograde structures is noted along the lamina . Intra-axonal transport is also found to be disrupted. There occurs retrograde death in the retinal ganglion cell body a month later, and distal axonal loss within 1 week by Wallerian degeneration. The site-specific localization to the lamina cribrosa should be considered in any theory of glaucomatous pathogenesis [61,62] .

Lamina cribrosa is situated at the converging interface of 4 pressure compartments: the intra ocular pressure, the retro- laminar sub- arachnoid space, the cerebrospinal fluid (CSF) space behind and the surrounding intra-orbital space. Extracellular matrix components in the lamina plays an important role in the pathogenesis of glaucomatous optic nerve damage [63]. Hyaluronate plays an essential role in the maintenance of the hydrodynamic properties of the extracellular matrix . It is found reduced in POAG, thereby

increasing susceptibility to IOP elevation [64]. Also the lamina cribrosa was noted to be significantly thinner in glaucomatous eyes [43].

MORPHOLOGY OF GLAUCOMATOUS OPTIC ATROPHY

- Retinal nerve fiber layer changes
- Optic nerve head changes
- Vascular changes
- Parapapillary changes

Retinal Nerve Fiber Layer changes

The loss of axonal bundles produces visible defects in the retinal nerve fiber layer .[65, 66,67] It is also seen in many neurologic disorders, ocular hypertensives and normal individuals. Many studies have shown retinal nerve fiber layer defects to be the most useful parameter in the early detection of glaucomatous damage [65-68].

- May be focal or diffuse.
- Slit like or groove like defects.
- Wedge shaped defects.(clearly defined areas that radiate from optic disc and widen peripherally)[69].

Optic nerve head changes [70-72]

- Assymetry between two cups of more than 20% in discs of equal size
- Focal notching.(usually begins in inferotemporal region)
- Concentric atrophy
- Diffuse concentric enlargement
- Deepening of the cup
- Progressive thinning of neuroretinal rim.
- Vertical elongation of the cup
- Saucerisation of the cup
- Shadow sign, or Laminar dot sign.
- Advanced glaucomatous cupping.

  Total Bean-pot cupping , which is seen clinically as a white disc with eventual loss of all neural rim tissue and bending of all vessels at the margin of the disc.

Vascular changes[73]

- Splinter haemorrhages
- Nasalisation of vessels
- Baring of the circumlinear blood vessels.
- Bayoneting (Double angulation of blood vessel)

Parapapillary changes

These are chorioretinal atrophy surrounding the optic nerve head and it has two zones.[74,75]

Zone beta: is the innermost bordering of disc margin.It exhibits chorioretinal atrophy with visibility of sclera and large choroidal vessels. It is larger and and more common in POAG .

Zone alpha:It concentrically surrounds the beta zone and exhibits variable irregular hyper/hypopigmentation of retinal pigment epithelium.It is larger in POAG patients but its frequency is same in glaucoma and normal individuals.

ROLE OF CENTRAL CORNEAL THICKNESS IN GLAUCOMA.

IMPORTANCE OF CENTRAL CORNEAL THICKNESS.

Measurement of corneal thickness can be of value in:

- Clinical diagnosis and management of patients with glaucoma and glaucoma suspects.
- Diagnosis and progression of certain corneal disorders such as Fuchs endothelial dystrophy,Congenital Hereditary Endothelial Dystrophy.
- Following up patients with keratoplasty to determine endothelial cell function and its decompensation.
- Preoperative assessment and planning of all keratorefractive surgeries(eg LASIK,radial keratotomy)
- Prior to cataract surgery in cases with compromised endothelial cell function
- Assessing the thinning of cornea as in keratoconus.
- Assessing the level of a corneal opacity.

Implications of CCT on Intra Ocular Pressure.

The association between central corneal thickness and intraocular pressure measurement is a known fact and IOP will be either overestimated or underestimated in those eyes with thicker or steeper corneas and thinner or flatter corneas respectively [76].

In recent studies CCT is considered as an intrinsic ocular risk factor in the pathogenesis of glaucoma and its progression[38,77] Several studies have concluded that CCT in POAG patients is thinner[78-80] or similar[81-84], to control individuals.

Goldmann applanation tonometry (GAT) is the gold standard method for measurement of IOP.[85] It is based on the Imbert-Fick law.Goldmann noted that when the area applanated was 7.35mm^2, the surface tension owing to the tear film was counterbalanced by the resistance to corneal indendation, thereby eliminating the need to consider the surface tension of the tear film and the globe rigidity[86] .

Changes in corneal thickness affects its resistance to indentation so that this it is not balanced exactly by the tear film surface tension,hence affecting the accuracy of IOP measurement. Lesser force is required to applanate a thinner cornea, thereby underestimating true IOP, while more force is required for thicker cornea giving falsely high reading.

A"normal" CCT of 520µm was taken in Goldman applanation tonometry[87,88].

Corneal thickness and IOP are positively correlated in several studies earlier[89-91].A substantial difference between the actual IOP and simultaneously measured applanation tonometry values were noted in eyes with manometrically controlled IOP and this was attributed to CCT. The IOP underestimation was upto 4.9mmHg in thin corneas and overestimation upto 6.8mmHg in thicker corneas. Hence corneal thickness measurement is required for the precise interpretation of applanation tonometry. For every 70 µm corneal thickness applanation tonometry over/underestimated IOP by 5mmHg.

To get a correct IOP reading various correction factors have been reported by various researchers[.91,93,94] .A correction factor for IOP, to adjust for CCT measurements that differ from "normal CCT" was given by **Ehlers et al**[91].According to him ,CCT of 545µm needs no correction and a correction factor of upto +7mmHg is applied for thin corneas (445µm) and -7mmHg for thick corneas(645µm)

MEASUREMENT OF CENTRAL CORNEAL THICKNESS

Measurement should be taken ideally before dilatation and gonioscopy It has been reported that fluctuations in occur in CCT when it is measured at different times of the day.Several studies have proven that the cornea thickens during sleep ,with maximum values noted in the morning [8,92]. Given its diurnal fluctuation, measurement of CCT between 11 am and 2 pm approximates a subject's mean value.

The application of topical drops (Timolol 0.5% or Betoxolol hydrochloride 0.5%, 2 times per day) do not cause a significant effect on CCT after one year of treatment provided the baseline endothelial density is >1500 cell/mm^3 and CCT <0.68mm [26]. CCT can be measured by an optical method and with ultrasound, the latter being more reliable[93] .

Ultrasound (US) pachymetry

This instrument available is portable,and relatively inexpensive in comparison to other radiological techniques.There is no radiation hazard,and the patient can be examined in comfort .The greatest advantage of ultrasound in ophalmic evaluation is its incredible diagnostic yield [94].

Principle

Ultrasound is an acoustic wave compressions and rarefactions that propagate within fluid and solid substance.By definition,ultrasonic waves exhibit frequencies above 20khz,and they differ from sound waves because these high frequencies render them inaudible.Because it is a wave , ultrasound can be directed,focused and reflected according to the same general principles that govern these phenomena with other waves,such as light.

This technique is according to the principles of ultrasonographic measures of the axial length of the globe. The key element in any ultrasonography system is a piezoelectric transducer,which is used to generate an ultrasononic echo returning from within the eye. A typical transducer unit consist of.

1) A thin disc of piezoelectric material such as as lead zinc titanate,a backing section and
2) An acoustic lens which focuses the generated ultrasound beam.The entire unit is called as transducer.The transducer is coated with a layer of coupling gel and held in contact with the globe or lid.The gel affords a transmission path for ultrasound,which is rapidly absorbed in air.Generation and detection of ultrasound takes place in the piezoelectric material.When piezoelectric transuducer is immersed in a fluid and electrically excited,vibrations generate an ultrasonic wave

of compressionand rarefaction that propagates through the fluid.These waves termed as longitudinal or compressional ultrasonic waves,are the type used for tissue visualization. The smallest tissue thickness that can be resolved by an ultrasonic system is termed axial resolution and is determined by the time and duration of the ultrasonic pulse. Shorter durations are needed toresolve thin segments. This fact can be illustrated by considering the conditions needed to resolve the cornea, which is typically 0.5mm thick and gives rise to echoes separated by 0.6micro seconds.

Technique:

It requires corneal contact and uses the Doppler effect to determine central corneal thickness.It is a rapid and accurate test. The ultrasound pachymeter averages multiple readings taken in one to two seconds by the sound waves of the probe, when it is held perpendicular to the corneal surface of the patient who is positioned in a reclining position .The reading is indicated by a “beep sound” when the probe is held within ten degrees to the perpendicular.

Probes:

Corneal thickness measurement with ultrasonic pachymetry requires the contact of the ultrasonic probe with the corneal surface. Earlier probes were difficult to use, but probes with gel or tips have replaced water filled

probes. Probe frequency is 20MHz. Even small movements of the probe from the initial measurement location,invalidate the accuracy of the values.

Corneal indentation does not produce measurement errors; cornea can be slightly indented to avoid measuring the tear film.Also indentation tends to decrease movement of the probe during measurement, resulting in more consistent and repeatable readings.Studies suggest that the intra and inter observer reading errors are less than 0.005mm and the degree of accuracy depend upon the measurement size [95].

Errors:

They can be due to:

1. Improperly aligning the probe with the cornea.

2. The varying speed of the sound through the corneal tissue.

3 Not relocating the same area to measure sequentially.

Advantages

1.High reproducibility.

2.No inter –observer variation.

3.No right /left variation.

DIAGNOSING PREPERIMETRIC GLAUCOMA

POAG represents a glaucoma continuum, in which RNFL loss occurs progressively through the stages of clinically unnoticeable stage ,early preperimetric glaucoma with nerve fiber defects and/or ocular hypertension ,progressing to manifest stage [96].

RNFL defects occur before demonstrable visual field defects [67],and now it is possible to measure objective RNFL thickness with newer diagnostic modalities like scanning laser polarimetry (GDx) and optical coherence tomography (OCT) .

RNFL Photography

Due to difficulties in measuring the RNFL thickness.,RNFL photography is routinely used as a qualitative detection method for detecting early RNFL loss[97].A fundoscopic camera and a red –free filter are used in taking analog and digital photographs in black and white.

RNFL photography has sensitivity and specificity averaging 80-94% for differentiation of glaucomatous and non glaucomatous eyes.

Evolution of the Nerve Fiber Analyzer

The first commercially available version of the NFA is known as the NFA I. It has been upgraded many times and the second type was called NFA II, and the next generations are NFA GDx, GDx VCC and GDx ECC

SCANNING LASER POLARIMETRY (GDX VCC):

Retinal nerve fibre layer analyzer.

This imaging technology which measures the peripapillary RNFL thickness and is based on the principle of birefringence.The main birefringent intraocular tissues are the cornea, lens and retina [98].

The microtubules of retinal ganglion cell axons are arranged parallel to each other causing a change in polarization of light passing through them. Retardation is defined as in the change in polarization of light, that can be quantified.The retardation value and the RNFL thickness are proportionate to each other and GDX utilizes this technology [99,100]. The GDX variable corneal compensator(GDX VCC Carl Zeiss Meditec) is the latest generation.

The RNFL is composed of highly ordered parallel axonal bundles. These axons have microtubules,cylindrical intracellular organelles of diameter smaller than that of wavelength of light.The retinal birefringence occurs because of the highly ordered structure of microtubules.

The splitting of light wave by a polar material into two components which travel at at different velocities creating a relative phase shift is known as **birefringence** .The phase shift is termed as retardation which is propotional to nerve fiber layer thickness.

Polarized light is selectively retarded by a polarizing/birefringent structure with alignment perpendicular to the incident rays of light. When a polarized light (near infrared 780nm) is projected on to the retina, the incident ray and the reflected ray double pass the RFNL before emerging. Because of the property of birefringence RNFL causes a change in polarization of the light. This is known as retardation[101].

Scanning laser polarimeter is a confocal scanning laser ophthalmoscope along with an integrated ellipsometer to quantify the retardation. It measures point by point thickness of RNFL in the peri papillary region over an 15^0X15^0 retinal area around the disc. A detector captures the amount of retardation and converts into thickness (in µm).

Near -infra red laser (780nm) beam is scanned in a raster pattern to obtain GDx VCC measurements. The raster scan captures an image with a field 40º horizontally and 20º vertically, which includes both the peripapillary and macular region. Total scan time take about 0.8 seconds.

The color coding is from yellow to red and then blue representing areas from high to low retardation. Bright color show thicker RFNL.A built in software excludes the images of blood vessels.The image acquisition and processing takes around 30 seconds and pupil dilation is not necessary.

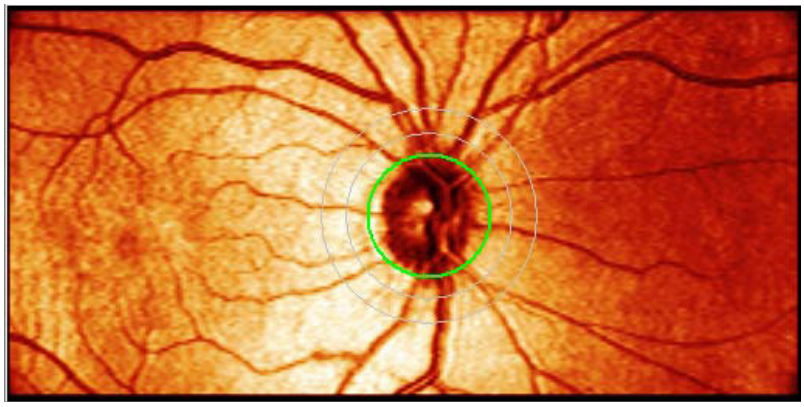
For analysis a ring is placed along the optic disc margins and measurement is automatically performed at 1.75 disc diameter away. It gives RFNL measurements in four quadrants of 120^0 superiorly and inferiorly,50^0 temporally and 70^0 nasally.It instantly compares the values with normative database provided in the computer and shows the level of significance.

The parameters outside normal range are flagged in red. It also gives an index number the higher the number the higher the probability that the patient has glaucoma.

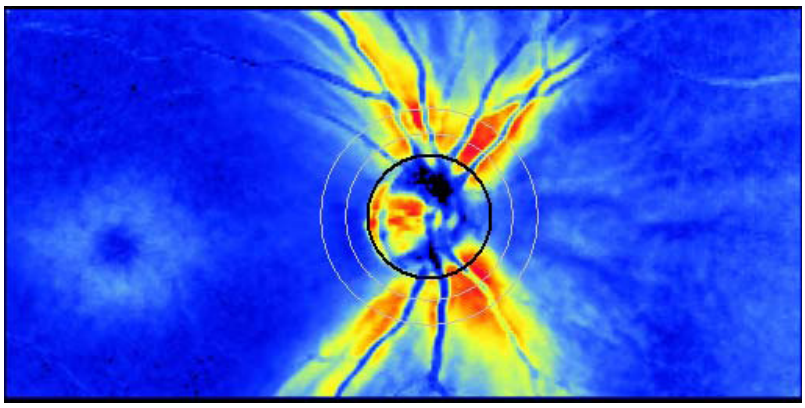
SLP measurements.

For each measurements,the GDx generates 2 images –

1. Reflectance image
2. Retardation image.



Reflectance image



Retardation image.

The reflectance image is obtained from the light reflected back from the retinal surface which is shown as the fundus image on the print outs.

The retardation image is generated from the map of retardation values which is transformed into RNFL thickness by a conversion factor of 0.67nm/µm.

Each image is formed by 256 (horizontal)×128 (vertical) pixels .Each pixel subtends 156º. 1 pixel is about 0.0465mm in size in an emmetropic eye.

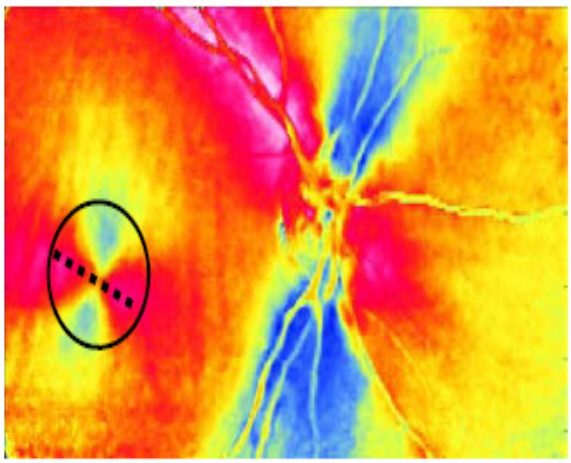
Anterior Segment Birefringence:

The birefringent structures apart from the RNFL are the cornea and lens .The total retardation is obtained from the cornea,lens and RNFL birefringence .Therefore Retinal Nerve Fiber Layer birefringence is obtained after compensating for anterior segment birefringence. The birefringence axis and magnitude of retardation are the parameters charecterising anterior segment birefringence.

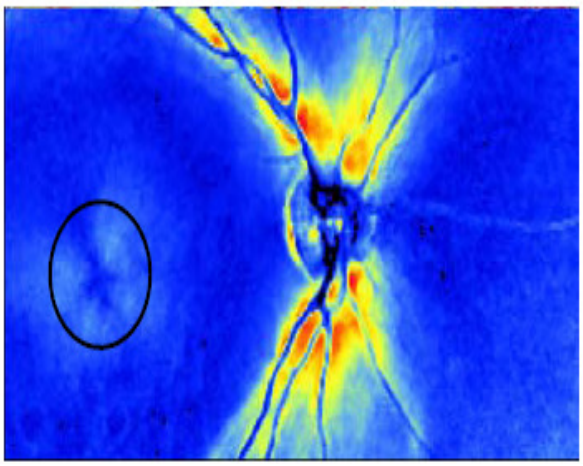
In early scanning laser polarimetry like GDx NFA , fixed values for the axis and magnitude of the anterior segment birefringence were used to compensate for anterior segment birefringence.

VARIABLE CORNEAL COMPENSATOR- VCC IN SLP TECHNOLOGY.

As the GDx VCC compensates for anterior segment birefringence of each eye, RNFL inaccuracies are eliminated [102].



The retardation image in uncompensated scan



After compensation of anterior segment birefringence

The radial distribution of Henle's layer is responsible for the uniform and symmetric birefringence in the macular region. The non uniform retardation pattern in macular region in uncompensated scans occur due to anterior segment birefringence. The axis and magnitude of anterior segment is computed by analysing the non uniform pattern around the macula.

The anterior segment birefringence axis is established by the orientation of 'bow- tie' birefringent pattern and the magnitude of anterior segment birefringence in the macula according to equations suggested by Zhou and Weinreb et al [103] . The retardation signal from the anterior segment is then compensated. Two linear retarders in rotating mounts forms the variable corneal compensator. The retardation profile around macula will have uniform ' bow tie pattern',after the compensation [104.]

An alternative method is used in cases of macular pathology that precisely compensates for the anterior segment birefringence. This analyses the birefringent pattern over a large area centered on the fovea (6*×6* square region) thereby reducing the effect of local irregularities on retinal birefringence.

The subject face is placed into the 'mask' of the GDX and a field of thin red horizontal lines is noted. Bright ,short, blinking horizontal red lights (like an equal sign) be seen will be seen on one side of the field which is the fixation target. It takes less than one second for the scan acquisition.

Clinical Interpretation of the GDX VCC Printout [105]

Components of the GDX report

Patient data and quality score:

Patient's name ,gender, date of birth and ethnicity are recorded at the top of the printout. A quality score (Qvalue) from seven to ten is considered ideal.

Fundus image:

It is a reflectance image of the posterior pole measuring 20° by 20°.More than 16 ,000 data points are used by GDx to construct the fundus image. During the process of scanning, this image is used for evaluating the quality of the scan .The ellipse is centered over the ONH in the image and its size is defaulted to a small setting which changes on manipulating the calculation circle .

The area between the two concentric circles, which measures the TSNIT and NFI parameters forms the calculation circle.By adjusting the size of the calculation circle and ellipse , we can measure beyond a large peripapillary atrophy area.

For each GDX VCC scan, an age-matched comparison is made to the normative database and any significant deviations from normal limits are flagged as abnormal with a P value. The four key elements in the print out providing the quantitative RNFL measurement are the

- Thickness map ,
- Deviation map ,

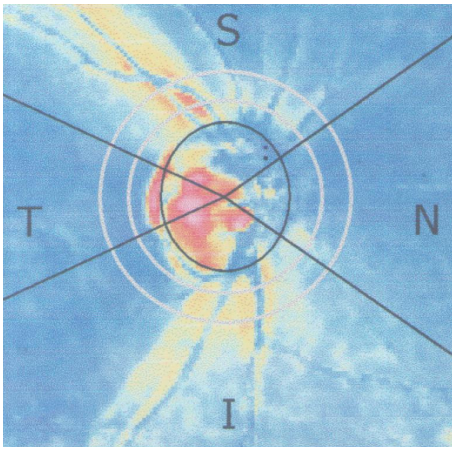
- TSNIT graph and
- Parameter table.

RNFL thickness map:

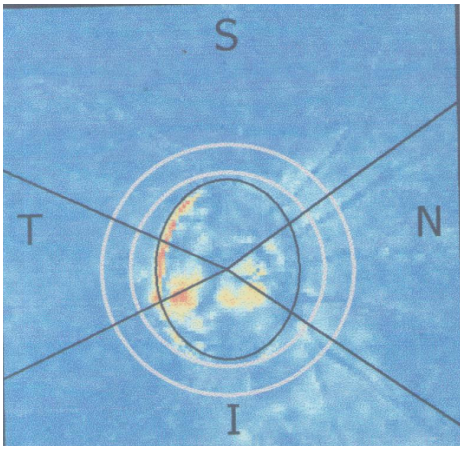
The different thicknesses of peripapillary RNFL can be depicted color coded format with the color spectrum going from blue to red. It represents the retardation level of the different scanned points.

Thicker RNFL values are coded by yellow, orange, and red color.

Thinner RNFL values are coded by dark blue, light blue, and green color.



Thicker RNFL



Thinner RNFL

A typical scan pattern will have a thick RNFL superiorly and inferiorly, similar to a vertical bow-tie.

The Deviation Map

The deviation map shows the location and magnitude of RNFL defects over the entire thickness map. The Deviation Map analyzes a 128 x 128 pixel region (20° x 20°) centered on the optic disc. To reduce variability due to slight anatomical deviations between individuals, the 128 x 128 pixel thickness map is averaged into a 32 x 32 square grid, where each square is the average of a 4 x 4 pixel region (called super pixels).

For each scan, the RNFL thickness at each super pixel is compared to the age- matched normative database, and the super pixels that fall below the normal range are flagged by colored squares based on the probability of normality. Dark blue squares represent areas where the RNFL thickness is below the 5th percentile of the normative database.

This means that there is only a 5% probability that the RNFL thickness in this area is within the normal range, determined by an agematched comparison to the normative database. Light blue squares represent deviation below the 2% level, yellow represents deviation below 1%, and red represents deviation below .05%.

In this map, grayscale fundus image of the eye is used as a background, and abnormal grid values are displayed as colored squares over this image.

TSNIT map

The TSNIT map stands for Temporal-Superior-Nasal- Inferior-Temporal map and displays the RNFL thickness values along the calculation circle that starts temporally and moves superiorly, nasally, inferiorly, and finshes temporally. In a normal eye the TSNIT plot follows the typical 'double hump' pattern, with thick RNFL measures superiorly and inferiorly and thin RNFL values nasally and temporally.

The TSNIT Graph shows the curve of the actual values for that eye along with a shaded area representing 95% normal range for that age.The TSNIT curve will fall within the shaded area in a healthy eye and below this shaded area if there is RNFL loss,especially in the superior and inferior regions.

The TSNIT graphs for both eyes are displayed together in the center of the printout at the bottom. In a healthy eye there is good symmetry between the TSNIT graphs of the two eyes and the two curves will overlap. However, in glaucoma, one eye often has more advanced RNFL loss and therefore the two curves will have less overlap. A dip in the curve of one eye relative to another is indicative of RNFL loss. The the center of the

printout has the parameters displayed in a table. The TSNIT parameters are summary measures based on RNFL thickness values within the calculation circle. The parameters are compared with the normative database and then quantified in terms of probability of normality.Green color is used for displaying normal parameters whereas abnormal values are color-coded depending upon on their probability of normality.

The calculation circle is a fixed circle (a fixed size band) centered on the optic nerve head. The band is 0.4 mm in width, has an outer diameter of 3.2 mm and an inner diameter of 2.4mm.

The **five TSNIT parameters** are

- TSNIT Average,
- Superior Average,
- Inferior Average,
- TSNIT Standard Deviation and
- Inter-Eye Summary.

TSNIT Average: The average RNFL thickness around the entire calculation circle.

Superior Average: The average RNFL thickness in the superior 120° region of the calculation circle

Inferior Average: The average RNFL thickness in the inferior 120° region of the calculation circle.

TSNIT SD :

This measure captures the modulation (the peak to trough difference) of the double-hump pattern. A high modulation in the double-hump RNFLpattern is noted in a normal eye, whereas a low modulation in the double-hump pattern is noted in a glaucomatous eye.Inter-eye Symmetry: It denotes the degree of symmetry between the right andleft eyes by correlating the TSNIT functions from both eyes. Values range from –1 to 1, where values near 1 denotes good symmetry. Normal eyes have values around 0.9 indicating good symmetry.

The Nerve Fiber Indicator (NFI):

It is a global measure based on the entire RNFL thickness map. NFI is a sensitive indicator of the likelihood that an eye has glaucoma. It is only a proprietary value and its exact origin has not been published. It is generated using datas within and outside the calculation circle and uses an advanced form of neural network, called a Support Vector Machine (SVM). Entire RNFL thickness map information is used by SVM to optimize the discrimination between normal and glaucomatous eyes.

The output of the NFI is a single value that ranges from 1-100 and represents the overall integrity of the RNFL. Output values range from 1 – 100,with classification based on the ranges :

- 1 to 30 -- normal,
- 31 to 50 -- borderline,
- >51 -- abnormal

How to identify an abnormal scan.

Though there is no consensus on definition of an abnormal scan, the following guidelines can be used

TSNIT average, Superior average, Inferior average, TSNIT standard deviation,Intereye symmetry or NFI are abnormal at p <1% level They are considered Borderline if these are at p<5% level (In addition if NFI is > 47 at the p<1% level or >30 at p<5% level).

The normal values of these parameters in the Indian population as per R.P. Centre data base (40-70 yrs) are [105]:

- TSNIT Average = 54.8 + 4.1 (45.6-66.8) microns
- Superior Average = 66.8 + 6.7 (55.1-85) microns
- Inferior Average = 62.1 + 6.6 (38.9 – 74.3) microns
- NFI = 17.2 + 6.9 (4 – 35)

Detecting Progression of RNFL loss: Serial Analysis

The Serial Analysis printout can compare up to four examinations. The initial one is the baseline or reference exam, and follow-up exams are compared to this baseline exam. The deviation from Reference Map displays the RNFL difference with different color coding, pixel by pixel, of

the follow-up exam compared to the baseline exam.A colored rectangle to the left of the Thickness Map contains and quality score of each value along with the date.

Advantages of GDX VCC

- Easy operability.
- Pupillary dilatation not needed.
- Can be reproduced easily.
- Does not require a reference plane.
- Early detection before standard visual field.
- Comparison with age matched normative data base.

Limitations

- Does not measure actual RNFL thickness (inferred value).
- Does not differentiate true biological change from variability.
- No clinical studies on detection of progression using this technology.
- Limited use in moderate/advanced glaucoma.
- No data base from the Indian population.
- 4th machine prototype (cannot update earlier versions).
- Affected by anterior and posterior segment pathology.
    - Ocular surface disorders.
    - Macular pathology.
    - Cataract and refractive surgery.

- Refractive errors (false positive in myopes).
- Peripapillary atrophy (scleral birefringence interferes with RNFL measurement).

Clinical Value of Image Analyzers

No single imaging technique provides a better qualitative assessment of optic nerve head than precisely interpreted stereophotographs.

The GDXVCC is used in conjunction with other anatomical and functional tests and treatment started based on the patient´s individual risk .An abnormal GDX VCC gives an early warning signal so that the patient requires a closer and more frequent follow up. It is also very helpful in cases where the visual field is repeatedly unreliable .

REVIEW OF LITERATURE

Relationship between Central Corneal Thickness and Retinal Nerve Fiber Layer Thickness in Ocular Hypertensive Patients .

Ophthalmology 2005;112:251–256.

Polly A.Henderson et al did an observational cross sectional study to determine the correlation between retinal nerve fiber layer thickness as measured by scanning laser polarimetry and corneal thickness measurements in ocular hypertension patients.One eye was recruited from forty four OHT patients and forty eight healthy subjects.Imaging with GDx VCC scanning laser polarimeter was done. They analysed the relationship between GDx VCC RNFL measurements and central corneal thickness.Also relationship between RNFL parameters and age, IOP, SAP pattern standard deviation, and vertical CDR were studied.It was found that CCT in OHT patients were significantly higher than normal subjects (575±30 µm vs. 555±32 µm; P =0.002).High nerve fiber indicator (NFI) values, denoting thin RNFL were correlated significantly with thin CCT measurements in OHT patients (r=-0.502; P =0.001). Patients with thin corneas had significantly high NFI scores than those with thick corneas and control group .The study concluded that thinner RNFL was noted in OHT patients with thinner corneas than those with thicker corneas and healthy

subjects.RNFL defects assessed by the GDx VCC represents early glaucomatous damage in OHT eyes.

Central Corneal Thickness in the Ocular Hypertension Treatment Study (OHTS).

Ophthalmology 2001;108:1779–1788.

James D. Brandt et al studied the influence of corneal thickness on IOP measurement. The CCT of around thousand three hundred subjects in OHTS were measured and the mean value was correlated with race, baseline IOP,age, sex, systemic conditions and it was about 573.0 ± 39.0 µm. 24%of the OHTS subjects had central corneal thickness >600 µm. Mean CCTwas 23 µm thinner in African American subjects than for whites. Other factors associated with higher mean central corneal thickness were younger age, females, and diabetes.They concluded that thicker corneas were noted in OHT patients.and thinner corneas in African Americans. They concluded that the accuracy of applanation tonometry is influenced by CCT and has a definite role in screening and management.

The Ocular Hypertension Treatment Study.Baseline Factors That Predict the Onset of Primary Open-Angle Glaucoma.

*Arch Ophthalmol. 2002;120:714-720***.**

Mae O. Gordon et al described the demographic and clinical factors for POAG development in ocular hypertensives.Old age,male sex, large vertical CDR, ,higher IOP, greater pattern standard deviation in visual field,thinner central corneal measurement were associated with increased risk. Central corneal thickness was presumed to be a powerful predictor POAG occurance.

Based on the OHTS data the authors concluded that CCT gives idea about the risk of POAG development, and has an important role in the clinical evaluation of glaucoma suspects and for identifying patients at high risk for developing POAG so that early treatment is initiated in them.

Correlation Between Corneal and Scleral Thickness in Glaucoma.

J Glaucoma 2009;18:32–36.

Jelinar Mohamed-Noor et al assessed the correlation between central corneal thickness and anterior scleral thickness in POAG,NTG and ocular hypertension.It was presumed that thinner corneas were associatedwith thinner sclera and hence a thinner or weaker lamina cribrosa and optic nerve head tissues with altered biomechanical properties which in turn predisposes

to glaucoma. But there is no direct method for measuring the lamina cribrosa and sclera around the disc.Therefore a correlation between CCT and anterior ST has been studied.CCT and scleral thickness were measured using ultrasonic pachymetry and ultrasonic biomicroscopy in the temporal quadrant, about 2mm posterior to the scleral spur respectively.Among the 124 subjects recruited, OHT group had thicker CCT and Scleral thickness thicker than other groups. Correlation between CCT and ST was noted only in NTG patients .

They concluded that there was no correlation between CCT and ST in OHT, POAG, and controls.

Relationship Between Central Corneal Thickness and Localized Retinal Nerve Fiber Layer Defect in Normal-tension Glaucoma.

J Glaucoma 2006;15:120–123.

Hyuk Jin Choi et al conducted this study to determine the relationship between central corneal thickness (CCT) and extent of localized retinal nerve fiber layer (RNFL) defect of normal-tension glaucoma patients. 75 eyes of NTG patients with localized RNFL defect and corresponding field defects at the initial visit were taken. They studied the subjects age,IOP,CCT ,approximation of the RNFL defect to fovea (angle α), circumferential width of the RNFL defects(angle β),CDR. Thinner CCT was associated with increased vertical CDR, decreased angle α, and

increased angle β.The study concluded that CCT determination in NTG patients predicts the structural damage as given by vertical cup-to-disc ratios, angle α and β .

Use of the GDx to detect differences in retinal nerve fibre layer thickness between normal, ocular hypertensive and early glaucomatous eyes. *Eye* 2000 ;14: 367-370.

Kamal C. Bunce et al studied the differences in the RNFL thickness between normal, ocular hypertensive and POAG eyes using the GDx. Selection bias was removed by not including the clinical appearance of the RNFL and disc. The Kruskal-Wallis analysis of variance and the Mann-Whitney U-test were used for statistical analysis. Significant differences in RNFL thickness was noted between normal and OHT patients as compared with POAG patients .Hence it is possible to differentiate POAG eyes fom normal eyes by RNFL thickness analysis using the GDx.

The role of scanning laser polarimetry using the GDx variable corneal compensator in the management of glaucoma suspects.

. *Br J Ophthalmol* 2006;90:1454–1457.

Shaikh et al analysed the role of scanning laser polarimetry using the GDx VCC in the clinical management of POAG suspects. Based on suspicious disc appearance and visual fields,suspects were recruited.Normal patients

were excluded.Patients with high risk of developing progressive glaucoma, and were followed up.Out of the twenty patients GDx VCC results were abnormal in nineteen patients. Only among two patients the result were normal, though a neuroretinal rim defect was noted in the optic disc. Thus Scanning laser polarimetry using the GDx VCC is an important modality in the management of patients suspicious optic discs and unreliable visual fields as it picks up RNFL loss in pre-perimetric stage of glaucoma .

Corneal Thickness Measurement in the Management of Primary Open-angle Glaucoma. A Report by the American Academy of Ophthalmology. *Ophthalmology* 2007;114:1779–1787.

David K. Dueker et al analysed the literature to determine whether central corneal thickness is a significant risk factor for the development and progression of glaucomatous optic nerve damage in POAG. The authors reviewed 195 articles and each article was rated a particular level according to the strength of evidence ,design of the study and reference standards provided.They noted strong, consistent evidence that CCT is a risk factor for progression from OHT to POAG. Hence CCT measurement is important especially in POAG suspects and should be included in the examination of all patients with ocular hypertension.Intraocular pressure is the only modifiable risk factor in the management of glaucoma, and CCT significantly alters IOP measurement by applanation tonometry .Therefore

classifying CCT into broad subsets of thin, normal, and thick gives valuable information and understanding of an individual clinical course.

Clinical Significance of Central Corneal Thickness in the Management of Glaucoma. *Arch Ophthalmol.* 2004;122:1270-1275

A cross-sectional retrospective study was done by **Carolyn Y. Shih et al** to find the role of CCT in the clinical management of glaucoma patients and suspects. IOP adjustment of 1.5 mm Hg or more was considered measurement significant and IOP adjustment of 3.0 mm Hg or ore was considered outcome significant. Changes of eyedrops used and patient receiving laser therapy or surgery were recorded. Hundred and five patients among hundred and eighty patients had a measurement-significant adjustment in intraocular pressure and thirty eight patients had an outcomes-significant IOP adjustment (3.0 mmHg) The decision regarding glaucoma surgery was changed in six patients.

Thus the authors concluded that measurement of central corneal thickness by pachymetry has significant effect on glaucoma management.

Corneal Thickness as a Risk Factor for Visual Field Loss in Patients With Preperimetric Glaucomatous Optic Neuropathy.

Am J Ophthalmol 2003;136:805–813.

Felipe A. Medeiros et al studied the role of central corneal thicknes in visual field loss development in preperimetric stage. On follow up,repeatable visual field abnormality was noted among thirty five percent of the ninety eight patients. Among the risk factors for visual field loss a thin CCT ,high intraocular pressure and large vertical CDR were found.The mean CCT of patients who developed visual field loss was 543 $\pm$36 µm. The study inferred that CCT is a risk factor for visual field defect development in patients with early to moderate glaucoma .Hence CCT is important in setting target IOP in glaucoma patients.

AIMS AND OBJECTIVES

To correlate Central Corneal Thickness (CCT) measurements with Retinal Nerve Fibre Layer (RNFL) Thickness using scanning laser polarimetry (GDx-VCC) in Primary Open Angle Glaucoma (POAG) patients and POAG suspects.

OUTCOME MEASURES

Primary outcome measures

To assess the correlation between Central Corneal Thickness and RNFL parameters.

Secondary outcome measures

To assess the correlation between Central Corneal Thickness and Age ,Intra ocular Pressure and Vertical CDR.

MATERIALS AND METHODS

Study design – Observational cross sectional study.

Duration of study – One and half years. (Dec 2010 to May 2012)

INCLUSION CRITERIA

1. All patients diagnosed as **POAG** based on open angles with no apparent ocular/systematic abnormality accounting for the high IOP and typical glaucomatous visual field defects/ONH changes.

2.All patients diagnosed as **POAG suspects** on the basis of open angles by gonioscopy, and one of the following in at least one eye:

- Appearance of the optic disc or retinal nerve fiber layer suggestive of glaucomatous damage
- Diffuse or focal narrowing or sloping of the disc rim.
- Diffuse or localized abnormalities of the nerve fiber layer, especially at superior and inferior poles .
- Disc hemorrhage.
- Asymmetric appearance of the disc or rim between fellow eyes (e.g., cup to disc ratio difference greater than 0.2) suggesting loss of neural tissue.
- Visual fields suspicious for early glaucomatous damage .

3.Age >18 years.

4.Best corrected visual acuity of 6/24 or better.

5.Refractive error : sphere within ±5.0 diopters, and cylinder within ±3.0 diopters.

EXCLUSION CRITERIA.

1. Patients with any retinal pathology that is likely to damage the retinal nerve fibre layer like advanced diabetic retinopathy,retinitis pigmentosa.
2. Media opacities interfering with quality GDx- VCC scan like significant cataract, vitreous opacities .
3. Optic disc abnormalities (tilted disc, optic disc drusen, coloboma of the disc),Peripapillary atrophy.
4. Secodary glaucoma.
5. Patients with corneal scarring,history of corneal refractive surgeries,precluding accurate measurements of central corneal thickness.
6. Corneal edema,use of contact lens that may affect corneal thickness.
7. Ocular surface disorders.
8. Secondary causes of high IOP (e.g., iridocyclitis, trauma),
9. Non glaucomatous optic neuropathy.
10. Diseases affecting visual field (e.g., demyelinating diseases, pituitary lesions).

11. History of intraocular surgery (except for uncomplicated cataract and glaucoma surgery).
12. Extensive panretinal photocoagulation.

The data of all the eligible patients were collected on proforma.

SUBJECTS

Patients presenting to the Glaucoma Services at Aravind Eye Hospital, Madurai were recruited.305 eyes of 156 patients(In 7 POAG patients ,only 1 eye was included , other eye was excluded due to media opacity)who were diagnosed as Primary Open Glaucoma patients and 298 eyes of 149 POAG suspects satisfying the above criteria were included in the study.

STUDY PROCEDURE

After explaining the nature and possible consequences of the study, an informed consent was obtained from the subjects. The institutional ethical committee approved the study.Each subject underwent a comprehensive ophthalmic examination, including family history of glaucoma,medical and surgical history, best-corrected visual acuity, IOP measured by goldmann applanation tonometry, slit-lamp biomicroscopy, gonioscopy, and stereoscopic fundus evaluation on the slit lamp using a 90-diopter lens ,CCT was measured by ultrasonic pachymeter . CCT measurements were taken in the midpupillary axis .Topical proparcaine 0.5% was instilled in both the eyes. Patient was

seated straight and made to focus on the target away from fixation during measurements.Repeated sets of three readings were taken until the values differed by less than 10 μ and the mean value taken for the study. Color stereoscopic optic disc photographs and red-free nerve fiber layer photographs were captured on the Zeiss fundus camera. Baseline standard achromatic perimetry on the Humphrey field analyzer using the 24-2 testing protocol by Swedish interactive threshold algorithm standard strategy was performed .

All subjects underwent scanning on the GDx using the variable corneal compensation (VCC) method, the algorithm for which has been described elsewhere. In order to allow the GDx VCC to focus on the retina ,the spherical quivalent refractive error of each eye was entered into the software.The focus was adjusted manually in 0.25-diopter steps,if needed.The lights were left on and pupils were undilated. The patient's face was gently placed into the facemask of the GDx VCC.

The patient's head is held as vertical as possible during all measurements, in order to maintain the same orientation of the slow axes of the birefringent structures in the eye to that of the instrument's compensator. For each scan, the instrument should be aligned with the cornea and the sclera of the measured eye. All the images included in the study had good focus, uniform illumination, well-centered optic nerve head and quality score of 8 or better. The GDx VCC parameters investigated in this study

were Average thickness, Superior average,Inferior average, and Nerve fiber indicator (NFI).

Statistical Analysis

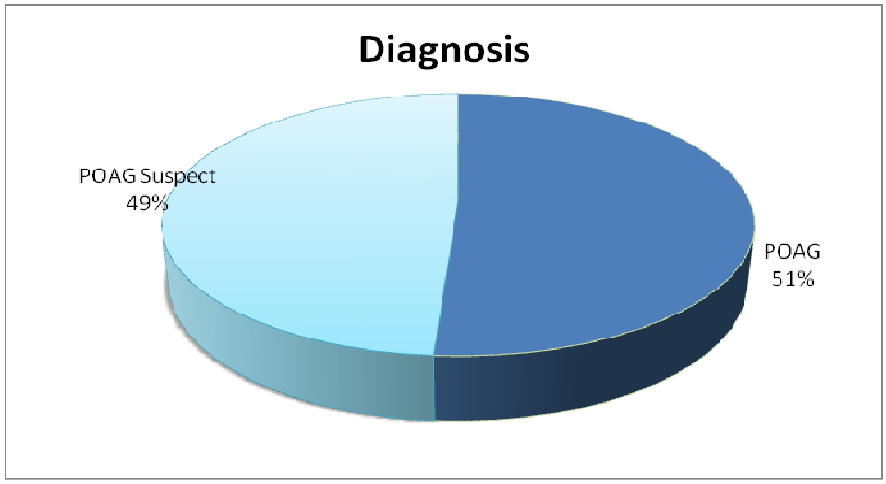
Continous variables were expressed as Mean (SD) and categorical variables were expressed as Frequency (percentage). t-test or ANOVA was used to assess the difference between continous variables. Chi-Square test or Fisher's exact test was used to assess the difference between categorical variables . Pearson's correlation coefficient was used to assess correlation between the continous variables.All statistitcal analysis were done by statistical software STATA 11.0. P Value less than 0.05 considered as statisfically significant.

RESULTS

Table 1. Age distribution

Age category (yrs)	POAG	POAG suspect	Total	P-value
<=40	18(11.5)	30(20.1)	48(15.7)	
41– 50	37(23.7)	40(26.9)	77(25.2)	
51 – 60	61(39.1)	46(30.9)	107(35.1)	0.146
61 – 70	37(23.7)	28(18.8)	65(21.3)	
>70	3(1.9)	5(3.4)	8(2.6)	
Total	156	149	305	

Graph 1



Age wise distribution.

Among 156 POAG patients and 149 POAG suspects,higher percentage belonged to the age group category 51-60 years.There was no statistically significant association between POAG patients and POAG suspects in age wise distribution.(Table 1,Graph 1 and 2)

Graph 2

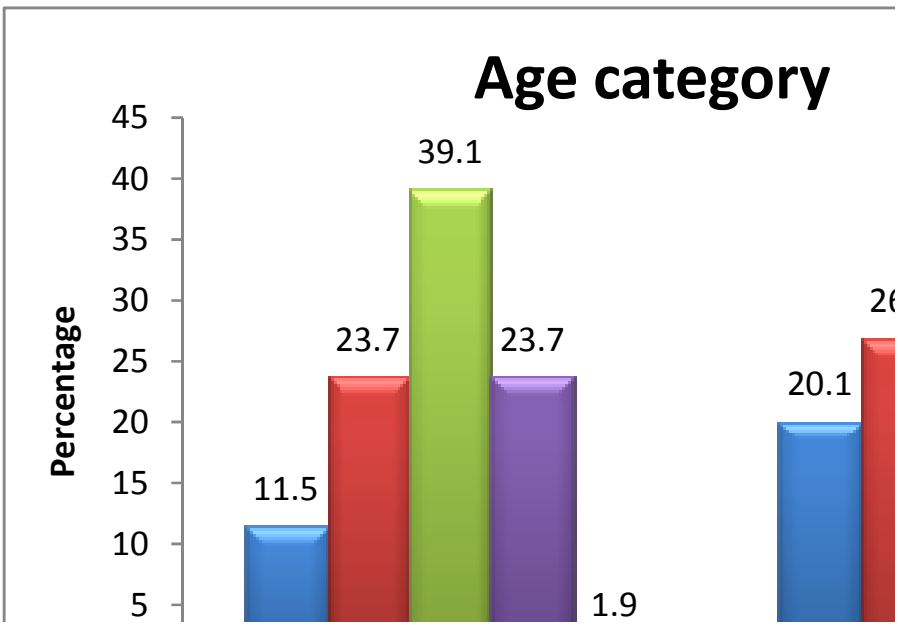
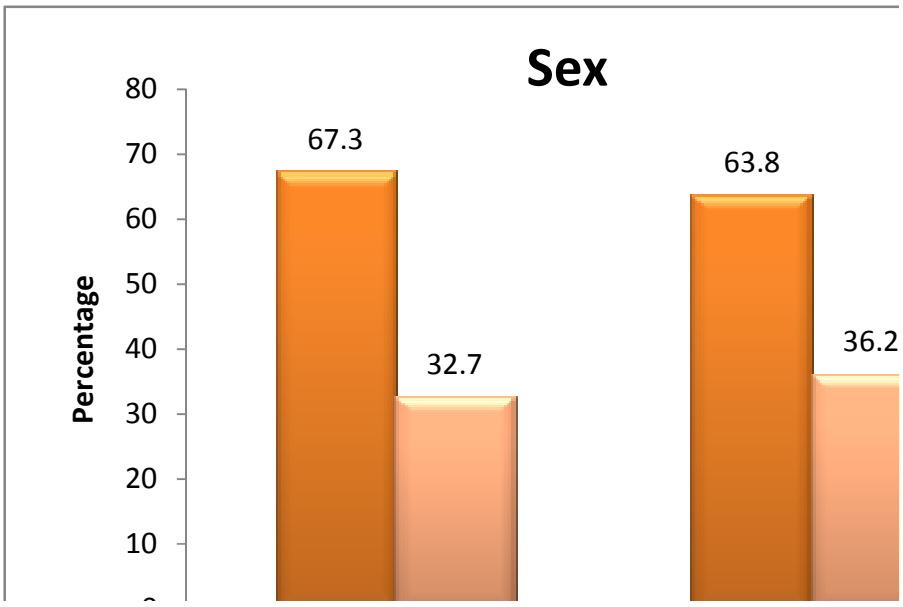

Age category
Percentage
45
40
35
30
25
20
15
10
5
11.5
23.7
39.1
23.7
1.9
20.1

Table 2. Sex wise distribution.

Sex	POAG	POAG suspect	Total	P-value
Male	105(67.3)	95(63.8)	200(65.6)	0.514
Female	51(32.7)	54(36.2)	105(34.4)	
Total	156	149	305	

Graph 3



Sex wise distribution .

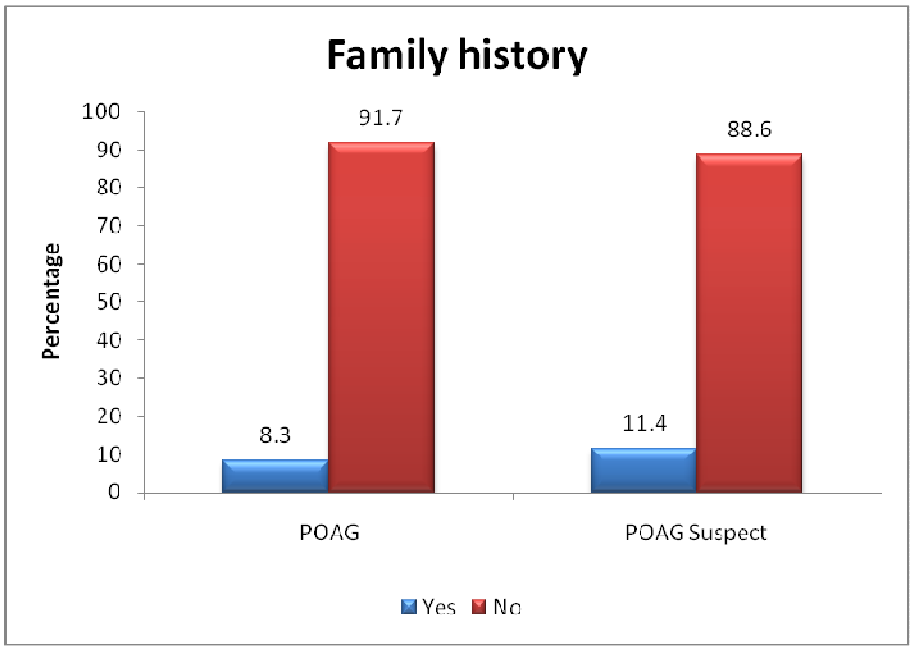
Among POAG patients ,male patients were 105 and females were 51 .In POAG suspects,male patients were 95 and females were 54 . Both groups had a significantly higher proportion of males (Table 2,Graph 3)

Table 3

Family history of glaucoma

Group	Total	Family history n (%)
POAG	156	13(8.3%)
POAG suspect	149	17(11.4%)
Total	305	30(9.8%)

Graph 4



Family history wise distribution

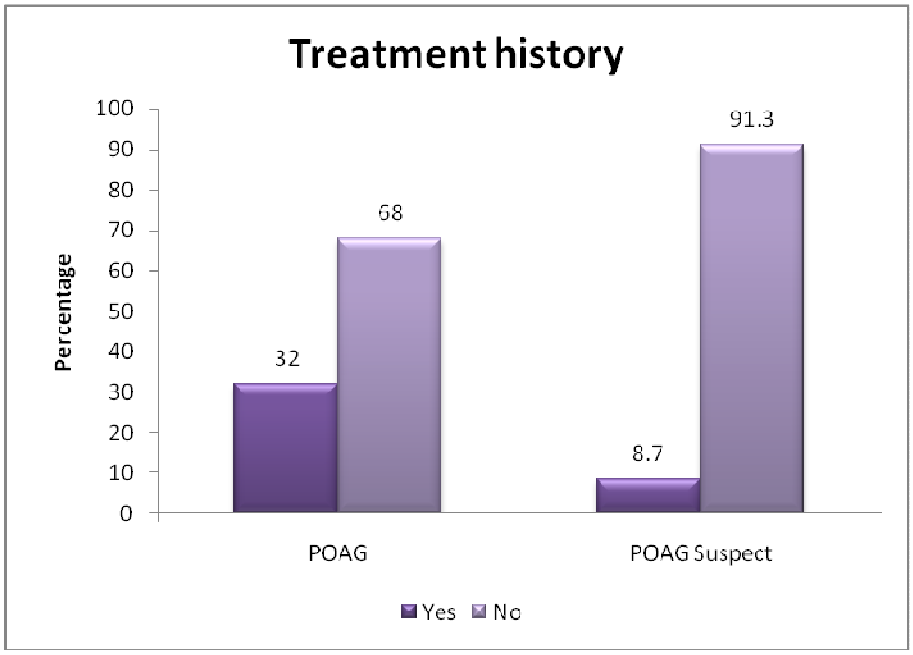
About 8.3% POAG patients and 11.4% suspects had family history of glaucoma . (Table 3,Graph 4).

Table 4

Previous history of Treatment with anti- glaucoma medications.

Group	Total	Treatment history n (%)
POAG	156	50(32.0%)
POAG suspect	149	13(8.7%)
Total	305	63(20.7%)

Graph 5



Treatment wise distribution.

32% POAG patients and 8.7% POAG suspects were already on anti-glaucoma medications. (Table 4,Graph 5).

Table 5

Intraocular Pressure distribution

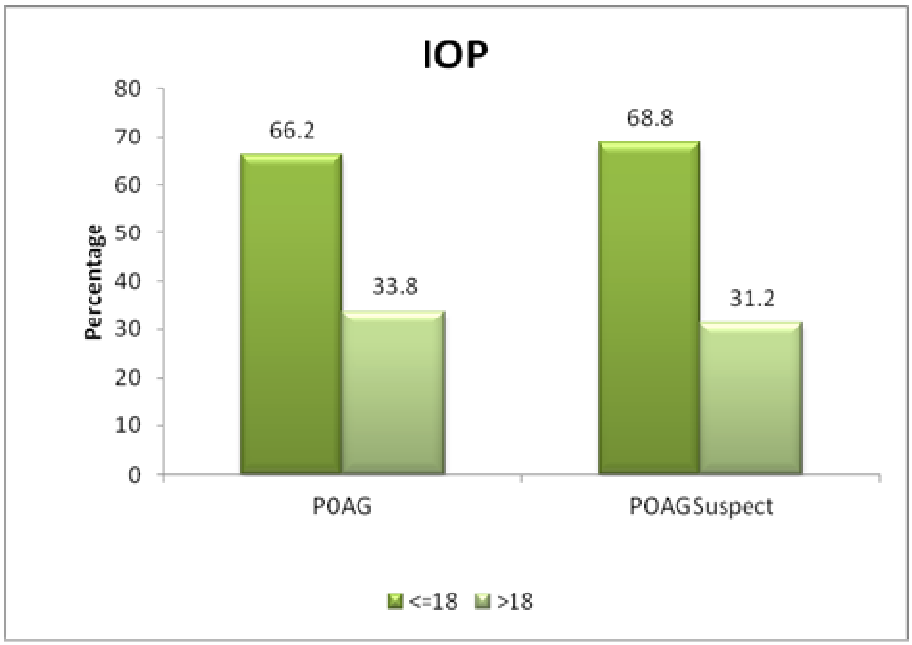
IOP (mm Hg)	POAG	POAG suspect	Total no.of eyes	P-value
<=18	202(66.2)	205(68.8)	407(67.5)	
>18	103(33.8)	93(31.2)	196(32.5)	0.502
Total	305	298	603(100.0)	

Table 6

Mean IOP in POAG and POAG suspects.

IOP	**N**	**Mean(SD)**	**Min – Max**	**P-value**
POAG	305	17.6(4.27)	12– 42	
POAG suspect	298	17.1(3.67)	12– 32	0.089
Total	603	17.4(4.00)	12 – 42	

Graph 6



IOP wise distribution.

Out of the 305 eyes of 156 patients,103 eyes had IOP greater than 18 mmHg and 93 eyes of 149 POAG suspects had IOP greater than 18 mmHg.The mean IOP(SD) in patient group was 17.6 (4.27) mmHg and 17 (3.67) mmHg in suspect group. (Table 5 and 6 ,Graph 6)

Table 7

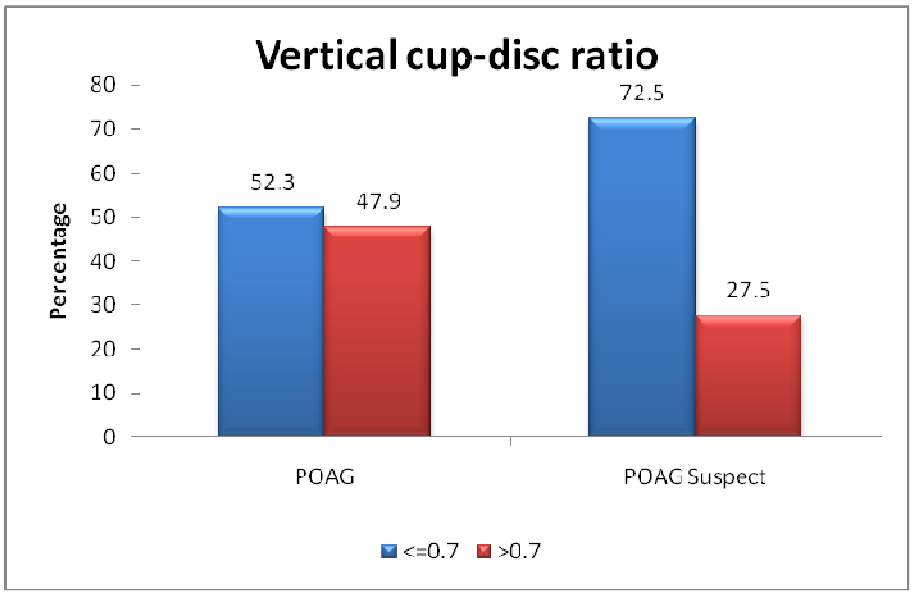
Mean Vertical CDR.

CDR	N	Mean(SD)	Min – Max	P-value
POAG	305	0.72(0.10)	0.40 – 0.95	<0.001
POAG suspects	298	0.67(0.09)	0.40 - 0.95	
Total	603	0.69(0.10)	0.40 – 0.95	

Vertical cup disc ratio (CDR)

Mean vertical CDR in POAG patients were significantly higher than in suspects (0.72 ± 0.10 vs 0.67 ± 0.09 ,$P < 0.001$). (Table7 ,Graph 7)

Graph 7



To analyze within the group differences, both POAG patients and POAG suspects in this study were stratified by the corneal thickness into CCT ≤520 µm, CCT between 520µm and 555 µm, and CCT >555 µm subsets, based on studies conducted in Indian population.[106]

Table 8

CCT wise classification in POAG and POAG suspects.

CCT (µm)	POAG	POAG suspect	Total no.of eyes	P-value
<520	99(32.5)	73(24.5)	172(28.5)	
520 – 555	109(35.7)	116(38.9)	225(37.3)	0.092
>555	97(31.8)	109(36.6)	206(34.2)	
Total	305	298	603(100.0)	

Graph 8

CCT wise distribution

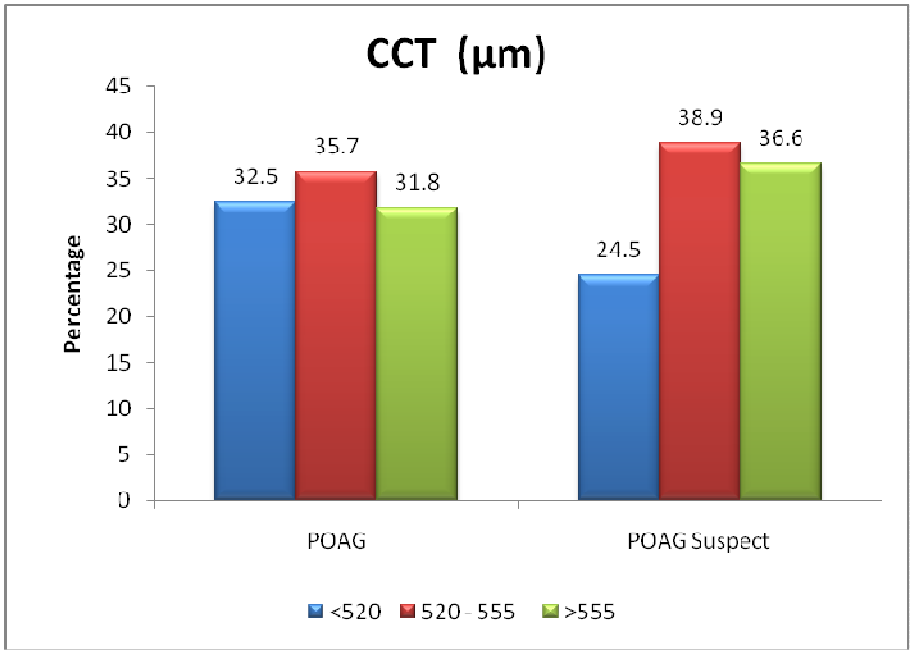


Table 9

Mean CCT in POAG and POAG suspects

CCT (µm)	N	Mean(SD)	Min – Max	P-value
POAG	305	540.4(36.0)	453 – 642	0.093
POAG suspects	298	548.4(36.7)	453 – 662	
Total	603	542.8(36.4)	453 – 662	

CCT wise classification. There was higher proportion of POAG patients in thin cornea subset than suspects which was statistically not significant.

The mean CCT (SD) in POAG patients and suspects were 540.4 (36) µm and 548.43(6.7) µm (Table 8,9 Graph 8).

Table 10

RNFL parameters obtained by Scanning Laser Polarimetry

in POAG and POAG suspects

RNFL parameters	POAG	POAG suspect	Total	P-value
Superior Average	55.7(11.68)	60.3(9.89)	57.9(11.07)	<0.001
Inferior Average	54.4(11.5)	59.9(10.39)	57.1(11.29)	<0.001
TSNIT Average	48.9(9.46)	52.3(8.04)	50.6(8.93)	<0.001
NFI	34.4(20.2)	24.7(14.1)	29.6(18.1)	<0.001

There was a statistically significant difference in RNFL parametrs between POAG and POAG suspects. (P value < 0.001) .Mean NFI was significantly higher in POAG group (Table 10)

ANALYSIS BETWEEN CCT VS AGE,IOP, Vertical CDR

Table 11

Correlation between CCT and Age, IOP, vertical CDR

Variable	POAG		POAG Suspect	
	r	P-value	r	P-value
CCT Vs Age	-0.169	<0.0001	-0.024	<0.0001
CCT Vs IOP	0.208	0.0003	0.281	<0.0001
CCT Vs Vertical CDR	-0.140	0.014	-0.066	0.258

.

Table 12. Relationsip between CCT category and Age

CCT (µm)	Mean Age (yrs)			P-value
	POAG	POAG suspect	Total	
<520	54.83(10.11)	51.71(11.89)	53.51(10.97)	0.066
520 – 555	54.72(11.06)	50.47(13.24)	52.52(12.39)	0.010
>555	50.86(11.75)	49.94(13.00)	50.37(12.39)	0.596
P-value	0.016	0.653	0.032	

Relationship between CCT and Age

Among the POAG group, the mean age (SD) were 54.8(10.11) in patients with thin corneas,54.7(11.06) in patients with average corneas, 50.8(11.75)in patients with thick corneas. In the POAG suspect group, the

mean age (SD) were 51.71 (11.89) in patients with thin corneas,50.47(13.24) in patients with average corneas, 49.94 (13) in patients with thick corneas. There was significant association between CCT subgroups and age in POAG group. (P value = 0.016) (Table 12)

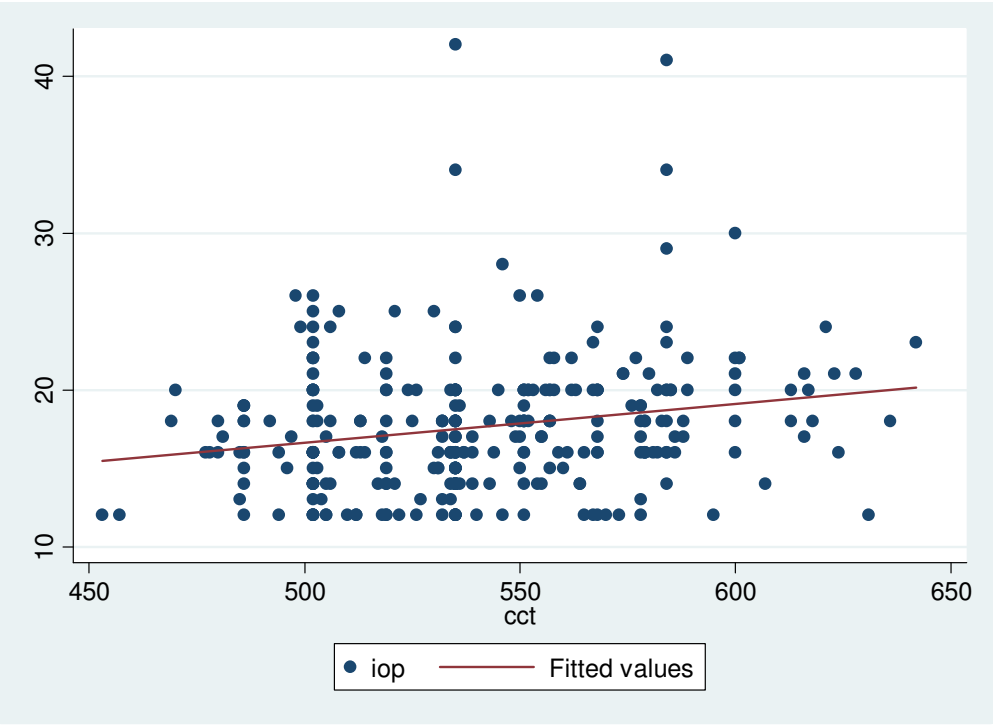
A **negative correlation** between CCT and age was noted in POAG patients (r= - 0.169,P value <0.001) and POAG suspects (r= - 0.024,P value<0.001) (Table11)

Table 13

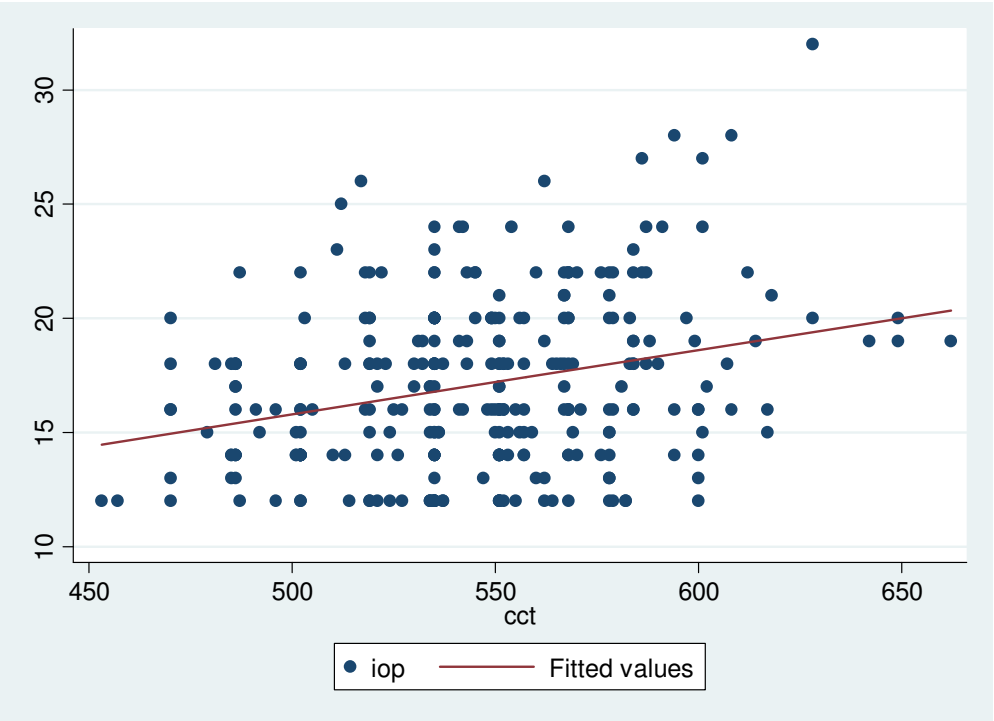
Relationship between CCT category and IOP.

CCT (µm)	IOP (mm Hg)			P-value
	POAG	POAG suspect	Total	
<520	16.81(3.66)	16.12(3.28)	16.52(3.51)	0.207
520 – 555	17.33(4.42)	16.65(3.27)	16.98(3.88)	0.187
>555	18.79(4.46)	18.17(4.06)	18.46(4.25)	0.290
P-value	0.003	0.0003	<0.001	

Graph 9 CCT Vs IOP in POAG



Graph 10. CCT Vs IOP in POAG suspect.



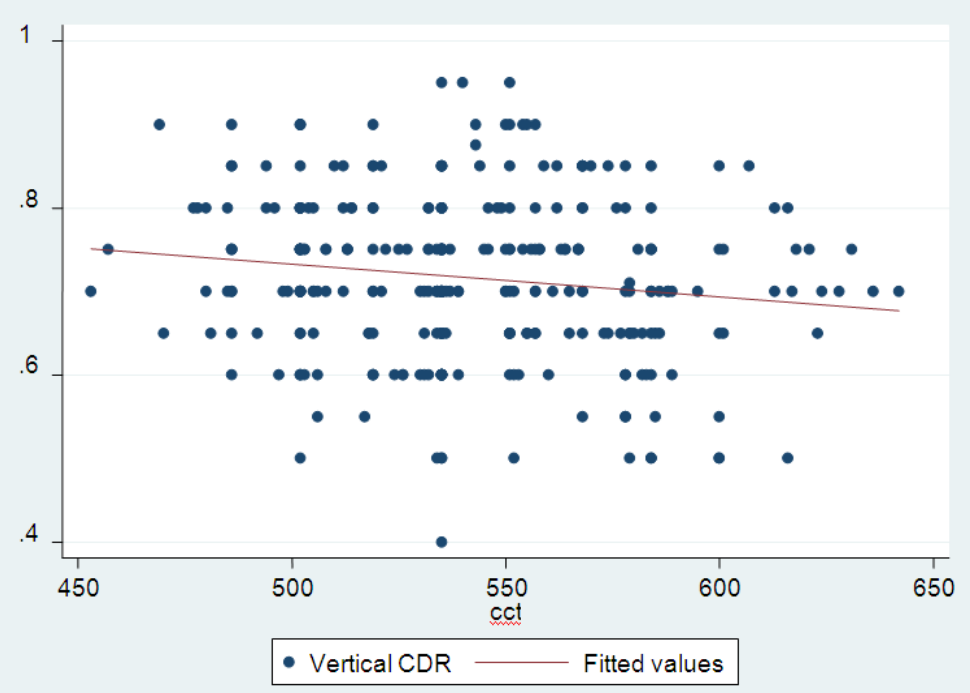
There was statistically significant diferrence in mean IOP values between the CCT category in both POAG patients (P value =0.003) and POAG suspects(P value =0.0003).(Table 13)

A **positive correlation** between CCT and IOP was noted in both patients (r value =0.208, P value= 0.0003) and POAG suspects (r value=0. 281 ,P value<0.0001). (Table 11 ,Graph 9,10)

Relationship between CCT and Vertical cup disc ratio.

CCT negatively correlated with vertical CDR in POAG (r value = - 0.140, P value=0.014) but no correlation was noted in suspects (r value= - 0. 066 ,P value = 0.258). (Table 11,Graph11,12)

Graph 11. CCT Vs Vertical CDR in POAG



Graph 12.CCT Vs Vertical CDR in POAG suspects

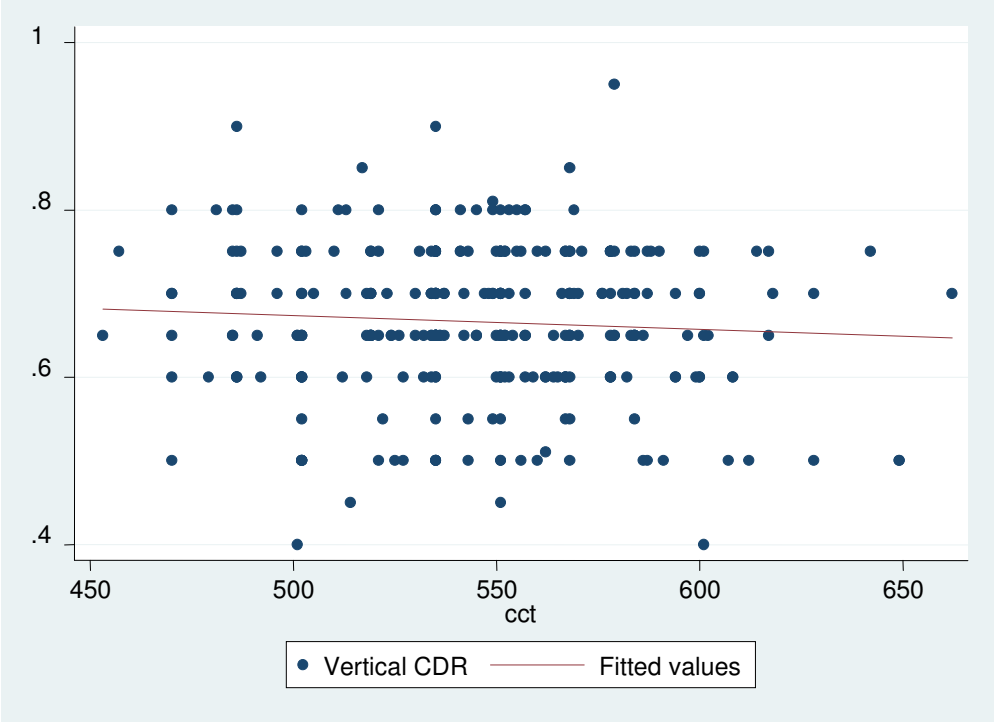


Table 14

CORRELATION BETWEEN CCT AND RNFL PARAMETERS.

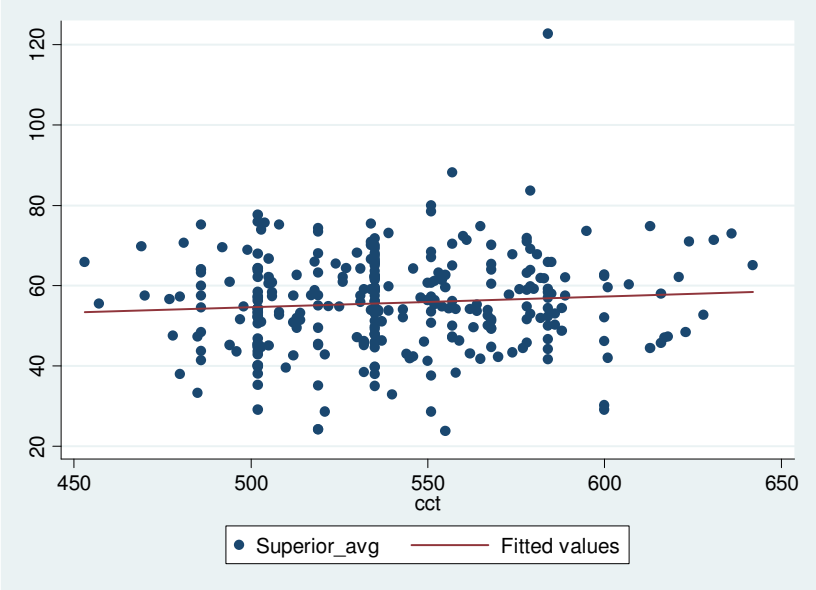
Variable	POAG		POAG Suspect	
	r	P-value	r	P-value
CCT Vs Superior Average	0.082	0.153	0.111	0.550
CCT Vs Inferior Average	0.075	0.192	0.140	0.016
CCT Vs TSNIT Average	0.115	0.045	0.129	0.027
CCT Vs NFI	-0.050	0.389	-0.108	0.064

Table 15

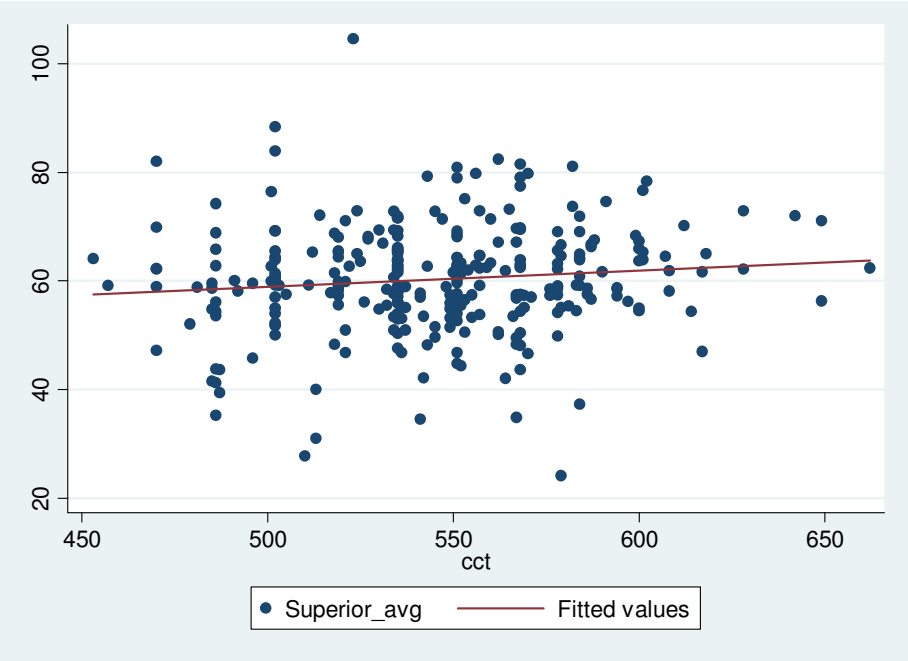
Relationship between CCT and Superior Average.

CCT (µm)	Superior Average			P-value
	POAG	POAG suspect	Total	
<520	54.29(11.62)	58.59(10.96)	56.12(11.51)	0.015
520 – 555	55.71(10.75)	60.10(9.05)	57.97(10.13)	0.001
>555	57.09(12.68)	61.60(9.90)	59.48(11.49)	0.005
P-value	0.245	0.128	0.013	

Graph 13. CCT Vs Superior Average in POAG



Graph 14.CCT Vs Superior Average in POAG suspect



Correlation of CCT Vs Superior Average.

There was no statistically significant difference in Mean Superior Average values between CCT catergory in POAG. (P value =0.245) & POAG suspect (P value = 0.128)

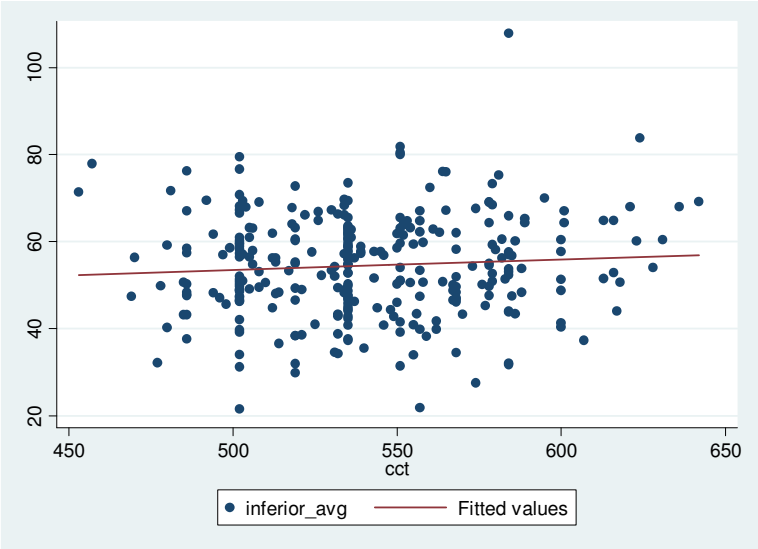
CCT did not correlate with Superior Average in both POAG (r value =0.082,P value=0.153) and POAG suspects (r value=0.111 ,P value=0.550). (Table 14,15, Graph 13,14,)

Table 16

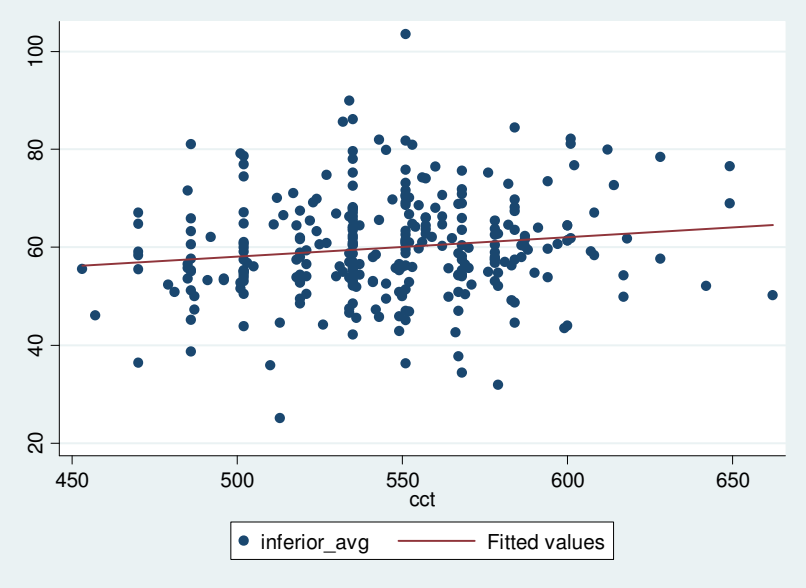
Relationship between CCT and Inferior Average.

CCT (µm)	Inferior Average			P-value
	POAG	POAG suspect	Total	
<520	53.83(11.44)	57.13(9.95)	55.23(10.92)	0.050
520 – 555	54.28(10.49)	60.82(10.99)	57.65(11.21)	<0.001
>555	55.25(12.67)	60.82(9.76)	58.20(11.54)	0.005
P-value	0.680	0.030	0.028	

Graph 15. CCT Vs Inferior Average in POAG



Graph 16. CCT Vs Inferior Average in POAG Suspect



There was no statistically significant difference in Mean Inferior Average values between CCT catergory in POAG. (P value =0.680) but significant difference between CCT catergory in both POAG suspects (P value = 0.03) was noted.

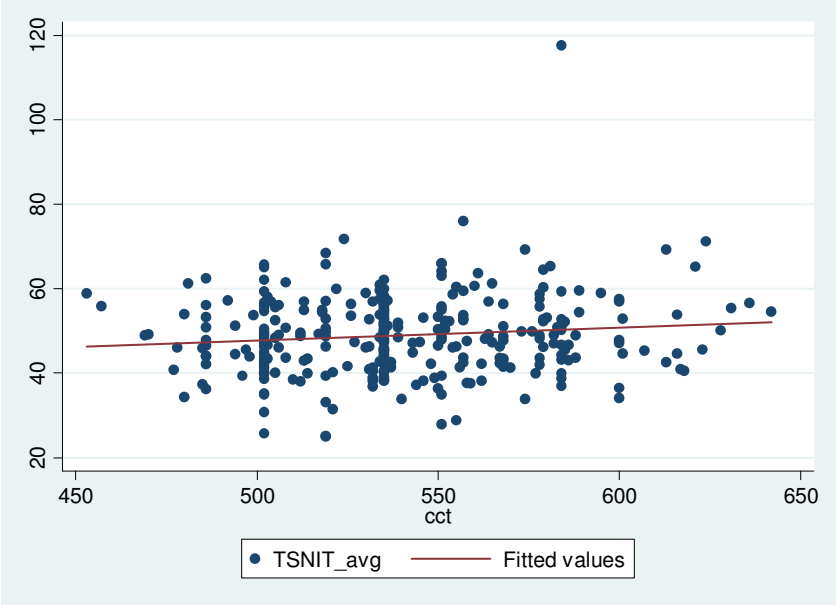
CCT did not correlate with Inferior Average in POAG (r value =0.075,P value=0.192) and POAG suspects (r value=0.140 ,P value=0.016). (Table14, 16 ,Graph 15,16)

Table 17

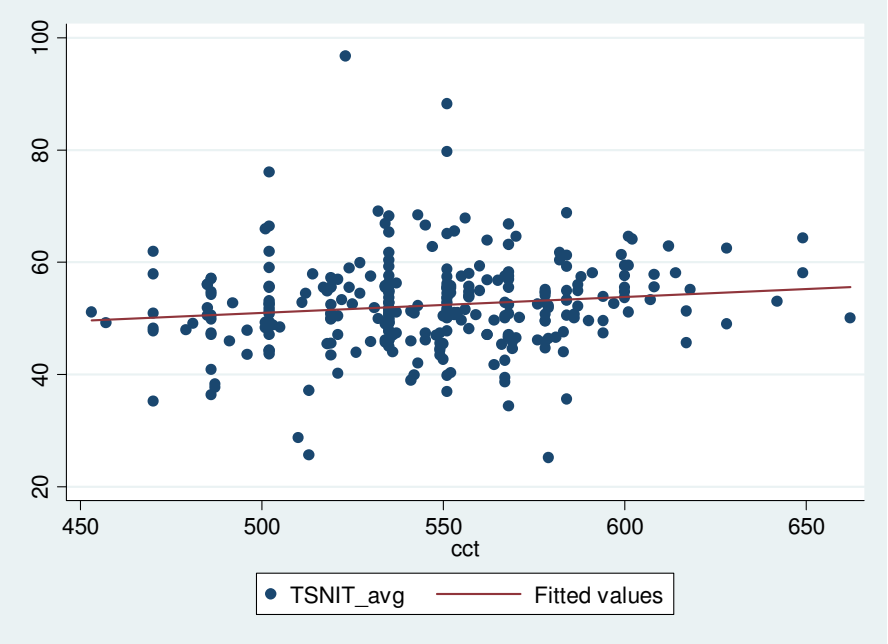
Relationship between CCT and TSNIT Average.

CCT (µm)	TSNIT			P-value
	POAG	POAG suspect	Total	
<520	47.74(8.89)	50.37(7.93)	48.86(8.57)	0.046
520 – 555	48.73(8.31)	52.95(8.76)	50.91(8.79)	0.0003
>555	50.38(11.01)	52.80(7.14)	51.66(9.22)	0.060
P-value	0.142	0.068	0.008	

Graph 17. CCT Vs TSNIT Average in POAG .



Graph 18.CCT Vs TSNIT Average in POAG suspects.



Correlation of CCT Vs TSNIT Average.

There was no statistically significant difference in Mean TSNIT Average values between CCT catergory in both POAG. (P value =0.142) & POAG suspect (P value = 0.068) .

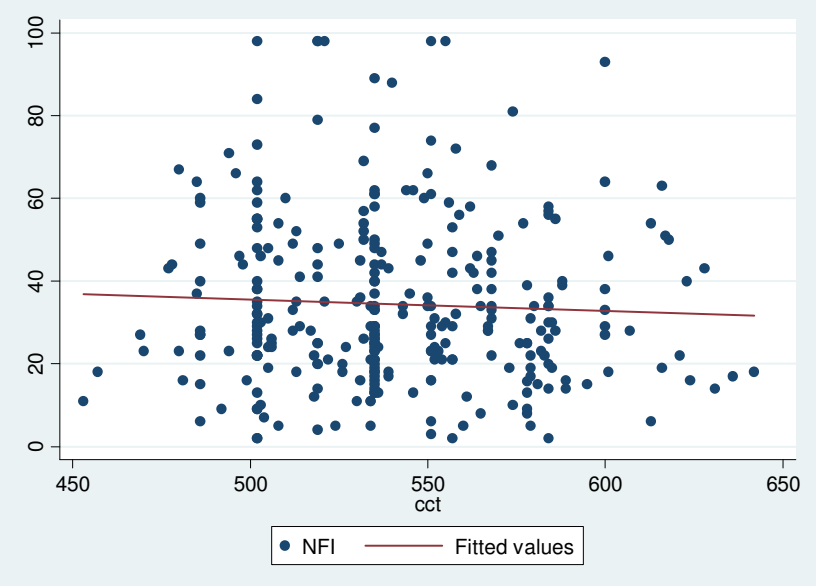
CCT significantly correlated with TSNIT Average in **POAG** patients (r value =0.115,P value=0.045) and **POAG suspects** (r value=0.129 ,P value=0.027). (Table 14,17, Graph17,18)

Table 18

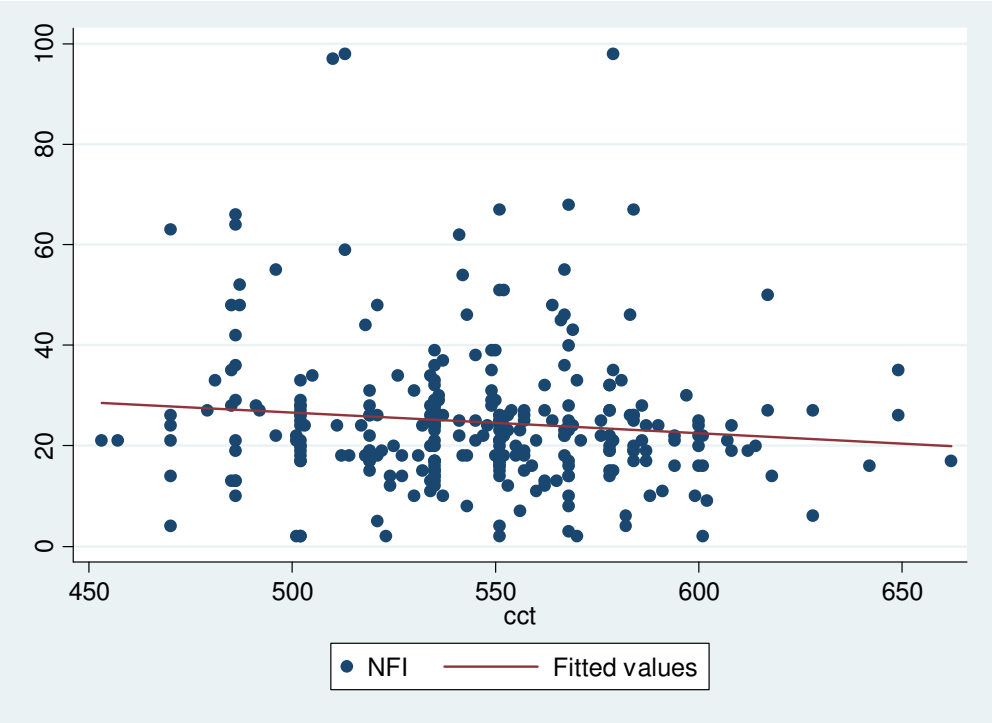
Relationship between CCT and Nerve Fiber Indicator.

CCT (µm)	NFI			P-value
	POAG	POAG suspect	Total	
<520	35.77(21.48)	28.03(17.98)	32.48(20.38)	0.013
520 – 555	34.83(20.88)	23.79(10.98)	29.14(17.40)	<0.001
>555	32.66(18.15)	23.53(13.79)	27.83(16.59)	0.0001
P-value	0.544	0.070	0.039	

Graph 19.CCT Vs NFI in POAG



Graph 20.CCT Vs NFI in POAG suspect



Correlation of CCT Vs Nerve Fiber Indicator (NFI).

There was no statistically significant difference in Mean NFI values among the three cornea subsets in POAG (P value = 0.544.) & POAG suspects (P value = 0.070)

There was negative but non significant correlation between CCT and NFI in POAG patients (r value = -0.050,P value=0.389) and POAG suspects (r value= - 0.108,P value=0.064). (Table 14,18,Graph 19,20)

DISSCUSION

Central corneal thickness (CCT) has been an area of much interest as an important risk factor for development of glaucoma. Management strategy in 15% of glaucoma patients is influenced by central corneal thickness [26]. The corneal thickness has been considered as a surrogate indicator of the overall structure and biomechanical properties of the eye. In the Ocular Hypertension Treatment Study (OHTS), a thinner central cornea was considered as a predictive factor in the development of primary open-angle glaucoma [28].

This study has been done to correlate Retinal Nerve Fiber Layer Thikness measured by Scanning Laser Polarimetry with Central Corneal Thickness measured by ultrasound pachymetry.CCT was correlated with GDx parameters namely Superior Average,Inferior Average,TSNIT Average,Nerve Fiber Indicator. Statistical analysis was done using Pearson'coefficient and P value < 0.05 was considered statistically significant.

In a study done by **Sushmita et al** [106] ,the mean CCT was found to be 542.3$\pm$21.5 µ among the normal population.We found that the overall CCT measurements in POAG patients were significantly lesser than in POAG suspects, 540.4µ versus 548.4µ, respectively.

According to **Doughty et al** [26],there is no age related differences in corneal thickness. In our study, we found that CCT correlated inversely with age in both groups.

Herndon et al [25] showed that an inverse correlation exists between CCT and the amount of glaucomatous optic nerve damage

Many studies have shown a relationship between CCT and IOP. **Hansen and Ehlers et al** [76] showed a statistically significant linear relationship between CCT and IOP as measured by applanation tonometry.A statistically significant positive correlation between CCT and IOP was noted in both patients and suspects in our study.

Distribution of CCT was studied in an ancillary study to the OHTS, and they found that patients with thinner cornea had 3 times the risk of developing POAG . To analyze within the group differences, both POAG patients and POAG suspects in this study were stratified by the corneal thickness into CCT <520 µm, CCT between 520 µm and 555 µm, and CCT >555 µm subsets,based on studies conducted in Indian population.

Jones et al [29] correlated thinner corneas with thinner lamina based on histomorphometric analysis.He suggested that among POAG patients, those with thinner corneas are more susceptible to RNFL loss and more severe glaucomatous damage. **Tarkan Mumcuoglu et al**[107] on behalf of

Advanced Imaging in Glaucoma Study Group, did a study to determine the correlation between CCT and RNFL,using three commonly used ocular imaging modalities namely confocal scanning laser ophthalmoscopy, scanning laser polarimetry and optical coherence tomography.By all of the methods,there was no statistically significant relationship between CCT and RNFL thickness in healthy eyes. They concluded that for GDx and OCT there was a slight nonstatistically significant positive correlation between CCT and RNFL thickness.

Polly A.Henderson et al [37] did an observational cross sectional study to determine the correlation between retinal nerve fiber layer thickness as measured by scanning laser polarimetry and corneal thickness measurements They analysed the relationship between GDx VCC RNFL measurements and central corneal thickness and concluded that thinner RNFL was noted in OHT patients with thinner corneas than those with thicker corneas and healthy subjects.

Sushmita Kaushik et al [108] studied the correlation between central corneal thickness (CCT) and retinal nerve fiber layer (RNFL) thickness and optic nerve head parameters measured by optical coherence tomography in ocular hypertensives (OHT).It was a prospective observational cross-sectional study in which 51 eyes of OHT patients and 35 normal eyes were grouped into thick (CCT >555 µm) and thin (CCT <555 µm) cornea

groups.OHT patients were classified into CCT <555µm, 556 to 588 µm, and >588 µm groups. In the OHT group, RNFL measurements and CCT correlated significantly.It was concluded that RNFL thickness in ocular hypertensives with CCT <555µ m was significantly thinner than in those with thicker corneas .RNFL thickness of normals and OHT patients with thick corneas were similar.

In our study significant difference in RNFL parameters were noted between POAG patients and suspects. Correlation between CCT and TSNIT Average was noted in both POAG and POAG suspects. Higher NFI value which indicates a thin RNFL did not corelate with thin CCT measurements in POAG patients and POAG suspects. The mean NFI was higher in the POAG group.

Previous studies that showed significant relationship between thinner RNFL and thinner CCT, were done in OHT patients whereas our study was done in POAG patients and POAG suspect group .In our study there was no significant diferrence in mean RNFL parameters between CCT subgroups,except for a significant difference in mean Inferior Average value in POAG suspects.

Corneal hysteresis is a proposed measure of corneal resistance to deformation. Other than CCT, corneal hysteresis also determines the the response of the corneo scleral shell to the force applied during IOP

measurement.Apart from CCT ,factors like corneal hysteresis that provides complete characterization of the biomechanical state of the cornea should measured

While our data did not find an association between CCT and Retinal Nerve Fiber Layer thickness, they do not exclude the significance of scleral or laminar thickness in glaucoma or the search for a reliable non-invasive method for its measurement.

Despite the lack of evidence supporting CCT as an independent risk factor for glaucoma progression, CCT affects IOP values as measured by applanation tonometry. As IOP is considered as the most important and only modifiable risk factor for glaucoma progression, knowledge of CCT is potentially important in managing both POAG patients and suspects.

CONCLUSION

1. There was a statistically significant difference in mean RNFL parameters between POAG patients and POAG suspects.
2. Among POAG patients ,CCT did not correlate with RNFL parameters except for TSNIT Average .
3. Among POAG Suspects, CCT did not correlate with RNFL parameters except for TSNIT Average .
4. CCC inversely correlated with age in both POAG and POAG suspects.
5. CCT correlated with Intraocular pressure in both POAG patients and suspects.
6. CCT inversely correlated with vertical Cup Disc Ratio in POAG patients.
7. The patients recruited in this study mostly belonged to early and moderate glaucoma as GDx was performed to detect early glaucomatous change. More subjects with advanced glaucoma should be studied to find the exact association.
8. Longitudinal experimental study are needed to find out changes in the Central corneal thickness over time in Primary Open Angle Glaucoma patients, particularly in patients with thinner corneas.

9. Serial follow up measurments of RNFL parameters should be done to document progressive glaucomatous damage.

GDx VCC (Scanning Laser Polarimeter)

Retinal nerve fiber layer changes in POAG

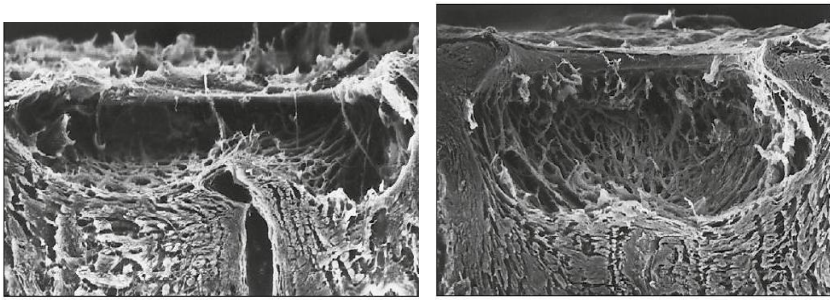
Fig.A **Fig. B**

Color Fundus (Fig.A) and Red free photograph(Fig.B) of a normal eye. The axonal bundles are thickest superiorly and inferiorly

Fig.C **Fig. D**

Fundus photograph (Fig.C) and Red free photograph (Fig.D) showing an inferior notch, wedge shaped defect in the RNFL and Disc Haemorrhage

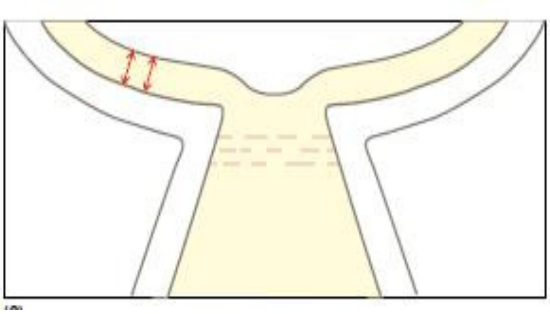
Pathophysiology of Primary Open Angle Glaucoma



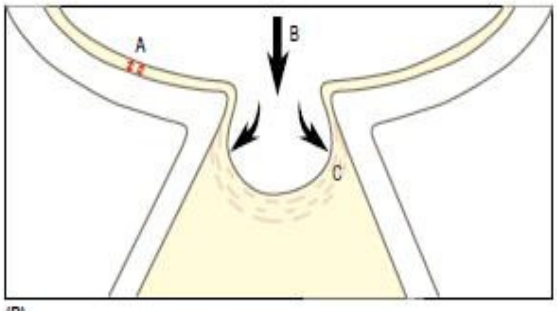
Scanning electron microscopy of human glaucomatous optic nerve heads .

A. Moderate glaucomatous damage

B Advanced glaucomatous damage

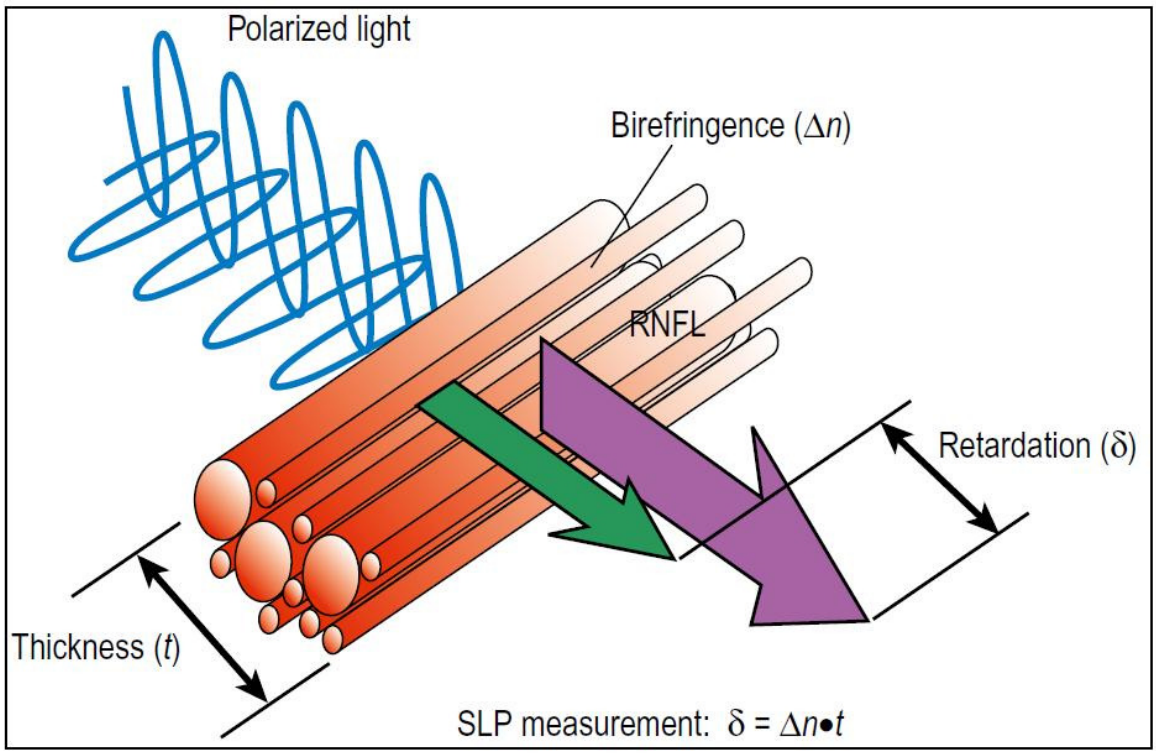


C. Normal optic nerve head



D. Three major alteration of glaucomatous damage are (1) The thinning of RNFL (2) posterior excavation and enlargement of central cup (3) posterior outward rotation of the lamina cribosa with cupping

BASIC PRINCIPLES OF SCANNING LASER POLARIMETRY



ULTRASOUND PACHYMETRY

MEASURMENT OF CENTRAL CORNEAL THICKNESS

BIBLIOGRAPHY

1.Quigley HA. Number of people with glaucoma worldwide.*Br J Ophthalmol*1996; 80: 389–393.

2 Klein BE, Klein R, Sponsel WE, et al. Prevalence of glaucoma.The Beaver Dam Eye Study. *Ophthalmology* 1992;99:1499–504.

3.Coulehan JL, Helzlsouer KJ, Rogers KD, Brown SI. Racial differences in intra ocular tension and glaucoma surgery.*Am J Epidemiol* 1980;111:759–68.

4. Kahn HA, Milton RC. Revised Framingham eye study prevalence of glaucoma and diabetic retinopathy. *Am J Epidemiol* 1980;111:769–76.

5. Tielsch JM, Sommer A, Katz J, et al. Racial variations in the prevalence of primary open-angle glaucoma.The Baltimore Eye Survey.*JAMA* 1991;266:369–74.

6. Leske MC, Connell AM, SchachatAP,et al. The Barbados Eye Study.Prevalence of open angle glaucoma.*Arch Ophthalmol* 1994;112:821–9.

7.LyneRacette, M. Roy Wilson, Linda M. Zangwill et al.Primary Open-Angle Glaucoma in Blacks: A Review.*SurvOphthalmol*48:295–313, 2003.

8. Dielemans I, VingerlingJR, Wolfs RC, et al. The prevalenceof primary open-angle glaucoma in a population based studyin the Netherlands. The Rotterdam Study.*Ophthalmology*1994;101:1851–5.

9. Shiose Y, Kitazawa Y, Tsukahara S, et al. Epidemiology of glaucoma in Japan: a nationwide Glaucoma survey. *Jpn JOphthalmol* 1991;35:133–5.

10.Kumar A, Basavaraj MG, Gupta SK, et al. Role of CYP1B1, MYOC, OPTN and OPTC genes inadult-onset primary open-angle glaucoma: predominanceof CYP1B1 mutations In Indian patients. *Mol Vis* 2007; 13:667–676.

11.R.Ramakrishnan,Praveen K. Nirmalan, R. Krishnadas, et al.Glaucoma in a Rural Population of Southern India, The Aravind Comprehensive Eye Survey.

Ophthalmology 2003;110:1484–1490.

12.Kourosh Mohammadi, Christopher Bowd, Robert N. Weinreb et al.

Retinal Nerve Fiber Layer ThicknessMeasurements With Scanning Laser Polarimetry Predict Glaucomatous Visual Field Loss.*Am J Ophthalmol* 2004;138:592–601.

13.Quigley HA, Addicks EM, Green WR. Optic nerve damage inhuman glaucoma. III: quantitative correlation of nerve fiberloss and visual field

defect in glaucoma, ischemic neuropathy, papilledema, and toxic neuropathy.

*Arch Ophthalmol*1982;100:135–146.

14..Kerrigan-Baumrind LA, Quigley HA, Pease ME,et al. Number of ganglion cells in glaucoma eyes compared with threshold visual field tests in the same persons. *Invest OphthalmolVis Sci*2000;41:741–748.

15.Quigley HA, Dunkelberger GR, Green WR. Retinal ganglion cellatrophy correlated with automated perimetry in human eyes with glaucoma. *Am J Ophthalmol*1989;107:453–464.

16.Pederson JE, Anderson DR.The mode of progressive disc cupping in ocular hypertension and glaucoma.*Arch Ophthalmol*1980;98:490–495.

17.Sommer A, Katz J, Quigley HA, et al. Clinical detectable nerve fiber atrophy precedes the onset of glaucomatous field loss. *Arch Ophthalmol*1991;109:77–83.

18. Sommer A, Miller NR, Pollack I, et al. Thenerve fiber layer in the diagnosis of glaucoma.*Arch Ophthalmol*1977;95:2149–2156.

19. Zeyen TG, Caprioli J. Progression of disc and field damage in early glaucoma. *Arch Ophthalmol*1993;111:62–65.

20.Pederson JE, Anderson DR. The mode of progressive disk cupping in ocular hypertension and glaucoma. *Arch Ophthalmol*1980;98:490–495.

21. Greaney MJ, Hoffman DC, Garway-Heath DF, et al. Comparison of optic nerve imaging methods to distinguish normal eyes from those with glaucoma. *Invest Ophthalmol Vis Sci* 2002;43:140–145.

22.Sommer A, Pollack I, Maumenee AE. Optic disc parameters and onset of glaucomatous field loss. I. Methods and progressive changes in disc morphology. *Arch Ophthalmol* 1979;97:1444–8.

23.Zangwill LM, Bowd C, Berry CC, et al. Discriminating between normal and glaucomatous eyes using the Heidelberg Retina Tomograph, GDx Nerve FiberAnalyzer, and Optical Coherence Tomograph. *Arch Ophthalmol* 2001;119:985–993.

24.Jost B. Jonas,Andrea Stroux, Isabel Velten, et al.Central Corneal Thickness Correlated with Glaucoma Damage and Rate of Progression.*Invest Ophthalmol Vis Sci*2005;46:1269–1274.

25.Herndon LW, Weizer JS, Stinnett SS. Central corneal thickness as a risk factor for advanced glaucoma damage. *Arch Ophthalmol* 2004;122:17–21.

26. Doughty MJ, Zaman ML. Human corneal thickness and its impact on intraocular pressure measures: a review and metaanalysis approach. *SurvOphthalmol* 2000;44:367– 408.

27.Shih CY, Graff Zivin JS, Trokel SL, et al. Clinical significance of central corneal thickness in the management of glaucoma. *Arch Ophthalmol* 2004;122:1270–5.

28.Gordon MO, Beiser JA, Brandt JD, et al. The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. *Arch Ophthalmol*. 2002;120:714–72.

29.Jost B. Jonas and Leonard Holbach.Central Corneal Thickness and Thickness of the LaminaCribrosa in Human Eyes.*Invest Ophthalmol Vis Sci.* 2005;46:1275–1279.

30.Anthony J. Bellezza,Christopher J. Rintalan, Hilary W. Thompson et al. Deformation of the Lamina Cribrosa and Anterior Scleral Canal Wall in Early Experimental Glaucoma.*Invest Ophthalmol Vis Sci*. 2003;44:623–637

31.Wolf 's anatomy of Eye and orbit,8 the dition,p624 -631.

32.Tripathi BJ, Tripathi RC, Livingston AM, et al. The role of growth factors in the embryogenesis and differentiation of the eye.*Am J Anat* 1991;192(4):442.

33.Yan DB, Coloma FM, Metheetrairut A, Easty DL. Deformation of the lamina cribrosa by elevated intraocular pressure. *Br J Ophthalmol.* 1994;78:643–648.

34. Quigley HA, Addicks EM. Chronic experimental glaucoma in primates. II. Effect of extended intraocular pressure elevation on optic nerve head and axonal transport. *Invest Ophthalmol Vis Sci*1980;19:137–152.

35.Hernandez MR, Andrzejewska WM, Neufeld AH. Changes in the extracellular matrix of the human optic nerve head in primary

open-angle *glaucoma. Am J Ophthalmol*1990;109:180–188.

36.Gordon MO, Beiser JA, Brandt JD, et al, Ocular Hypertension Treatment Study Group. The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open angle glaucoma. *Arch Ophthalmol*2002 ;120 :714 –20.

37.Henderson PA, Medeiros FA, Zangwill LM,et al. Relationship between central corneal thickness and retinal nerve fiber layer thickness in ocular hypertensive patients.*Ophthalmology* 2005;112:251–256.

38.Leske MR, Hafez AS, Descovits D. Relationship between central corneal thickness and changes of optic nerve head topography and blood flow after intraocular pressure reduction in open-angle glaucoma and ocular hypertension. *Arch Ophthalmol*2006;124(11):1568–1572.

39. Pakravan M, Parsa A, Sanagou M, et al. Central corneal thickness and correlation to disc size: a potential link to susceptibility to glaucoma. *Br J Ophthalmol*2007;91(1):26–28.

40.Toh T, Liew SH, Mac Kinnon JR, et al. Central corneal thicknessis highly heritable: the twin eye study. *Invest Opthalmol Vis Sci*2005;46(10):3718–3722.

41.Jonas JB,Berenshtein E, HolbachL Anatomic relationship between lamina cribrosa, intraocular space, and cerebrospinal fluid space. *Invest Ophthalmol Vis Sci*2003;44:5189–5195.

42.Jonas JB,Berenshtein E, Holbach L et al. Lamina cribrosa thickness and spatial relationships between intraocular space and cerebrospinalfluid space in highly myopic eyes. *Invest Ophthalmol Vis Sci*2004;45:2660–2665.

43.American Academy of Ophthalmology.Basic and Clincal Science Course.

2011-2012,Section 10,Pg 85-95.

44.Shields M Bruce .*Textbook of glaucoma*-6 th edition 2011.Pg176-184.

45.Roger C. W. Wolfs,Petra H. Borger,Raan S. Ramrattan et al.Changing Views on Open-Angle Glaucoma:Definitions and Prevalences—The Rotterdam Study .*Invest Ophthalmol Vis Sci*. 2000;41:3309–3321.

46.DoinaGherghel, Sarah L. Hosking, SelimOrguet al.Autonomic Nervous System, Circadian Rhythms,and Primary Open-Angle Glaucoma.*SurvOphthalmol*49:491–508, 2004

47.Mitchell P .Prevalence of open-angle glaucoma in Australia. The Blue Mountains Eye Study,*Ophthalmology* 103:1661, 1996.

48.Buhrmann RR, Quigley HA, Barron Y, et al: Prevalence of glaucoma in a rural East African population. *Invest OphthalmolVis Sci*;2000:41:40–8.

49.Perkins ES, Phelps CD.Open-angle glaucoma, ocular hypertension, low-tension glaucoma, and refraction. *Arch Ophthalmol* 100:1464, 1982.

50.Hewitt AW, Bennett SL, Fingert JH, et al. The optic nerve head in myocilin glaucoma.*Invest Ophthalmol Vis Sci* 2007; 48: 238–243.

51.Hewitt AW, Dimasi DP, Mackey DA, etal.A Glaucoma case control Study of the WDR36 gene D658G sequence variant. *Am J Ophthalmol* 2006; 142: 324–325.

52.Gonzalez P, Epstein DL, Borras T. Characterization of gene expression in human trabecular meshwork using single-pass sequencing of 1060 clones. *Invest OphthalmolVisSci* 2000; 41: 3678–3693.

53.Mitchell P, Smith W, Chey T, et al. Open angle glaucoma and diabetes. The Blue Mountains Eye Study. *Ophthalmology*1997;104:712–8.

54.Ehlers N, Bramsen T, Sperling S. Applanation tonometry and central corneal thickness. *ActaOphthalmol (Copenh)* 1975;53:34–43.

55. Whitacre MM, Stein RA, Hassanein K. The effect of corneal thickness on applanation tonometry.*Am J Ophthalmol* 1993;115:592– 6.

56.Sunil Shah, AnupamChatterjee, Manoj Mathai et al. Relationship between Corneal Thickness and Measured Intraocular Pressure in a General Ophthalmology Clinic.*Ophthalmology* 1999;106:2154–2160.

57.Kohlhaas M, Boehm AG, Spoerl E, et al. Effect of central corneal thickness, corneal curvature, and axial length on applanationtonometry. *Arch Ophthalmol*2006;124:471– 6.

58.James D. Brandt,Julia A. Beiser,Michael A. Kass, et al,Central Corneal Thickness in the Ocular Hypertension Treatment Study (OHTS).*Ophthalmology* 2001;108:1779–1788.

59.Burgoyne CF, Downs JC, Bellezza AJ, et al. The optic nerve head as a biomechanical structure: a new paradigm for understanding the role of IOP-related stress and strain in the pathophysiology of glaucomatous optic nerve head damage.*ProgRetin Eye Res*;2005;24:39–73.

60.Quigley HA, et al. Morphologic changes in the lamina cribrosa correlated with neural loss in open angle glaucoma, *Am J Ophthalmol*1983; 95:673.

61.Minckler DS, Spaeth GL.Optic nerve damage in glaucoma, *SurvOphthalmol* 26:128, 1982.

62.MorganW.The influence of cerebrospinal fluid pressure on the lamina cribrosa tissue pressure gradient, *Invest Ophthalmol Vis Sci*; 36:1163, 1995.

63.Fukuchi T, Ueda J, Abe H, et al. Cell adhesion glycoproteins in the human lamina cribrosa. *Jpn J Ophthalmol 2001*;45:363.

64. Gong H, Ye W, Freddo TF, et al. Hyaluronic acid in the normal and glaucomatous optic nerve. *Exp Eye Res* 1997; 64:587.

65.Schlottmann PG, De Cilla S, Greenfield DS, et al. Relationship between visual field sensitivity and retinal nerve fiberlayer thickness as measured by scanning laser polarimetry.*InvestOphthalmol Vis Sci* 2004;45:1823–1829.

66.Jonas JB, Schiro D. Localised wedge shaped defects of the retinal nerve fibre layer in glaucoma. *Br J Ophthalmol* 1994; 78:285.

67.Sommer A, Katz J, Quigley HA, et al. Clinically detectable nerve fiber atrophy precedes the onset of glaucomatous field loss. *Arch Ophthalmol* 1991;109:77

68.Quigley HA, Katz J, DerickRJ,et al. An evaluation of optic disc and nerve fiber layer examinations in monitoring progression of early glaucoma damage.*Ophthalmology*1992;99:19 –28.

69.Tuulonen A, Airaksinen PJ. Initial glaucomatous optic disk and retinal nerve fiber layer abnormalities and their progression. *Am J Ophthalmol*1991;111:485.

70.Kirsch RE, Anderson DR. Clinical recognition of glaucomatous cupping. *Am J Ophthalmol* 1973;75:442.

71.Jnas JB, Fernandez MC, Sturmer J. Pattern of glaucomatous neuroretinal rim loss. *Ophthalmology* 1993;100:63.

72.Spaeth GL, Hitchings RA, Sivalingam E. The optic disc in glaucoma: athogenetic correlation of five patterns of cupping in chronic open-angle glaucoma. *Trans Am AcadOphthalmolOtolaryngol*1976;81:217.

73.Sugiyama K, Tomita G, Kitazawa Y, et al. The associations of optic disc heorrhage with retinal nerve fiber layer defect and peripapillary atrophy in normal-tension glaucoma. *Ophthalmology* 1997;104:1926.

74.Jonas JB, NaumannGO. Parapapillarychorioretinal atrophy in normal and glaucoma eyes. Invest Ophthalmol Vis Sci 1989;30:919.

75. Jonas JB, Fernandez MC, NaumannGO. Glaucomatous parapapillaryatrophy : occurrence and correlations. Arch Ophthalmol 1992;110:214.

76.HansenFK,EhlersN,Elevated tonometer readings caused by a thick cornea.

ActaOphthalmol 1971;49:775-778.

77.Michael J. Doughtyand Mohammed L. Zaman.Human Corneal Thickness and Its Impact on Intraocular Pressure Measures: A Review and Meta-analysis Approach.*SurvOphthalmol* 44:367–408, 2000.

78.Aghaian E, Choe JE, Lin S, et al. Central corneal thickness of Caucasians,

Chinese, Hispanic, Filipinos, African Americans, and Japanese

in a glaucoma clinic. *Opthalmology*2004;111:2211–2219.

79. Bechmann M, Thiel MG, Roesen B, et al. Central corneal thickness determined with optical coherence tomography in various types of glaucoma.

Br J Opthalmol. 2000;84:688–691.

80. Wolfs RC, Klaver CC, Vingerling JR, et al. Distribution of central

corneal thickness and its association with intraocular pressure. *Am J*

*Opthalmol*1997;123:767–772.

81. Gorezis S, Gartzios C, Stefaniotou M, et al. Comparative results of central

corneal thickness measurements in primary open-angle glaucoma, pseudoexfoliation glaucoma, and ocular hypertension. *Ophthalmic Surg Lasers Imaging* 2008;39(1):17–21.

82.Ventura ACS, Bohnke M, Mojon DS. Central corneal thickness measurements in patients with normal tension glaucoma, primary open angle glaucoma, pseudoexfoliation glaucoma, or ocular hypertension. *Br J Ophthalmol*2001;85:792–795.

83. Lee ES, Kim CY, Ha SJ, et al. Central corneal thickness of Korean patients with glaucoma. *Ophthalmology*2007;114(5):927–930.

84.Ehlers N, Bramsen T, Sperling S: Applanation tonometry and central corneal thickness. *ActaOphthalmol (Copenh*) 53:34–43, 1975.

85.Duke-Elders S. *System of Ophthalmology*. St. Louis:1976. C.V. Mosby; Vol.XI.pp 379-560.

86.Schmidt TAF. The clinical application of the Goldmann applanationtonometer.*Am J Ophthalmol* 1960;49:967-78.

87.Whitacre MM, Stein R. Sources of error with use of Goldmann-type tonometers. *SurvOphthalmol* 1993;38:l-30.

88.Moses RA. The Goldman applanation tonometer.*Am J Ophthalmol* 1958;46:865-69.

89.Johnson M, Kass MA, Moses RA, Grodzki WJ. Increased corneal thickness simulating elevated intraocular pressure.*Arch Ophthalmol 1978*;96:664-65.

90.Hansen FK. A clinical study of the normal human corneal thickness.*ActaOphthalmol*1971;49:82-88.

91.Ehlers N, Bramsen T, Sperling S. Applanation tonometry and central corneal thickness. *ActaOphthalmol* 1975;53:34-43.

92.Lass JH, Khosrof SA, Laurence JK,et al. A Double-masked, randomized, 1-year study comparing the corneal effects of dorzolamide, timolol and betaxolol. *Arch Ophthalmol* 1998;ll6:1003-10.

93.Giasson C, Forthomme D. Comparision of central thickness measurements between optical and ultrasound pachymeters. *Optom Vis Sci* 1992;69:236-41.

94.Nissen J, Hjortdal JO, Ehlers N. A clinical comparison of optical and ultrasonic pachometry.*ActaOphthalmol* 1991;69:659-63.

95.Higgins S E, Fishbaugh JA, Strike DJ,et al. Reproducibility and variation of corneal thickness in different locations in the cornea as measured by an ultrasonicpachymeter. *Insight 1*993;18:14-18.

96.Weinreb R, Freidman S, Fechtner R, et al. Risk assessment in the management of patients with ocular hypertension. *Am J Ophthalmol.* 2004;138:458–467.

97.Soliman M, Van den Berg T, Ismaeil A, et al. Retinal nerve fiber layer analysis: relationship between optical coherence tomography and red-free photography. *Am J Ophthalmol.* 2002;133:187–195.

98. Reus N, Lemij H. Diagnostic accuracy of the GDx VCC forglaucoma.*Ophthalmology.*2004;111:1860–1865.

99. Laser Diagnostic Technologies, Inc. GDx VCC *Operation ManualVersion* 5.3, Part No. 251-0068D. San Diego, California.

100. Weinreb R, Zangwill L, Berry C, et al. Detection of glaucoma with scanning laser polarimetry. *Arch Ophthalmol.* 1998;116:1583–1589

101.Weinreb RN, Dreher AW, Coleman A, et al. Histopathologic validation of Fourier-ellipsometry measurements of retinal nerve fiber layer thickness. *Arch Ophthalmol*1990;108:557.

102.Greenfield DS, Knighton RW, Feuer WJ, et al. Correction for corneal polarization axis improves the discriminating power of scanning laser polarimetry. *Am J Ophthalmol*2002;134:27

103.Zhou Q, Weinreb RN. Individualized compensation ofanterior segment birefringence during scanning laser polarimetry.*Invest Ophthalmol Vis Sci*. 2002;43:2221–2228.

104.Weinreb RN, Bowd C, Greenfield DS, etal.Measurementof the magnitude and axis of corneal polarization with scanning laser polarimetry. *Arch Ophthalmol Jul* 2002;120:901–906.

105.Tanuj Dada,Harinder S Sethi.Clinical interpretation of Retinal Nerve Fiber Layer Analysis Using Scanning Laser PolarimetrywithVariable Corneal Compensation (GDX VCC).*DOS Times*December,2004;Vol.10, No. 5.

106.SushmitaKaushik,Surinder Singh Pandev.Measuring Intra Ocular Pressure.

How important is the Central Corneal Thickness?*Journal of Current Glaucoma Practice*.May-August 2007;1(1):21-24.

107. TarkanMumcuoglu, Kelly A. Townsend, GadiWollstein, et alAssessing the Relationship Between Central Corneal Thickness andRetinal Nerve Fiber Layer Thickness in Healthy Subjects.Am J Ophthalmol 2008;146:561–566.

108.SushmitaKaushik,JamyangGyatsho, Rajeev Jain, et al.Correlation Between Retinal Nerve Fiber Layer Thickness and Central Corneal Thickness in Patients With Ocular Hypertension: An Optical Coherence Tomography Study.*Am JOphthalmol* 2006;141:884–890.

PROFORMA

Name :

S.No :

Age :

MR.No :

Sex : ☐ (Male - 1, Female-2)

Diagnosis : ☐ (POAG -1, POAG Suspect-2)

Eye : ☐ (Right eye - 1, Left eye- 2)

Family history : ☐ (Yes - 1 , No – 2)

Systemic illness ☐ (Diabetic - 1, Hypertensive -2, Asthamatic -3 , Cardiac- 4, Others -5 , Nil – 8))

Treatment history : RE LE

Medical treatment ☐ ☐

(Yes – 1, No 2)

Specify _____

Total : _____

		RE	LE	
Surgical treatment :	IOL	☐	☐	(Yes – 1, No -8)
	Trab	☐	☐	(Yes – 1, No -8)
	Trab with IOL	☐	☐	(Yes – 1, No -8)
Visual acuity :	UCVA	☐	☐	
	BCVA	☐	☐	

Anterior segment examination

		RE	LE	
Cornea	:			(Clear – 1 , Edematous – 2 , Opacity – 3 , Others- 4)
Acdepth	:			(Normal – 1 , Shallow – 2)
Pupil	:			(Reacting – 1, RAPD- 2)
Lens	:			(Clear- 1, Lens changes- 2, Cataract -3 , PCIOL- 4, Aphakic- 5)

	RE	LE		
Intra ocular Tension				
NCT :				
Applanation tonometry :			mmHg	@ (_Time)
Gonioscopy			(open angle - 1, Narrow – 2, Closed – 3)	

Posterior segment examination **RE** **LE**

Disc diameter	:			(Normal -1, Small – 2, Large -3)
Vertical CDR	:			
Superior NRR	:			(Normal -1, Thin– 2, Loss -3)
Inferior NRR	:			(Normal -1, Thin– 2, Loss -3)
RNFL defects	:			(Normal- 1, Superior defect -2,Inferior defect-3)
Splinter Haemorrhage	:			(Yes- 1, No -2)
PPA	:			(Yes- 1, No -2)

Central corneal thickness (mean of 3 readings)

	RE	LE	
			(Thin <520µ – 1 , Medium 520-555µ –2 , Thick> 555 µ - 3)
Value	_____	_____	

GDX parameters **RE** **LE**

TSNIT average		
Superior average		
Inferior average		
TSNIT SD		
Inter eye symmetry		
Nerve Fiber Indicator		

(NFI 0-30- 1, 30-50 – 2 , > 50-3)

ABBREVIATIONS

BCVA- Uncorrected Visual Acuity

BCVA - Best Corrected Visual Acuity

CCT - Central Corneal Thickness

IOP - Intra Ocular Pressure

RNFL - Retinal Nerve Fiber Layer

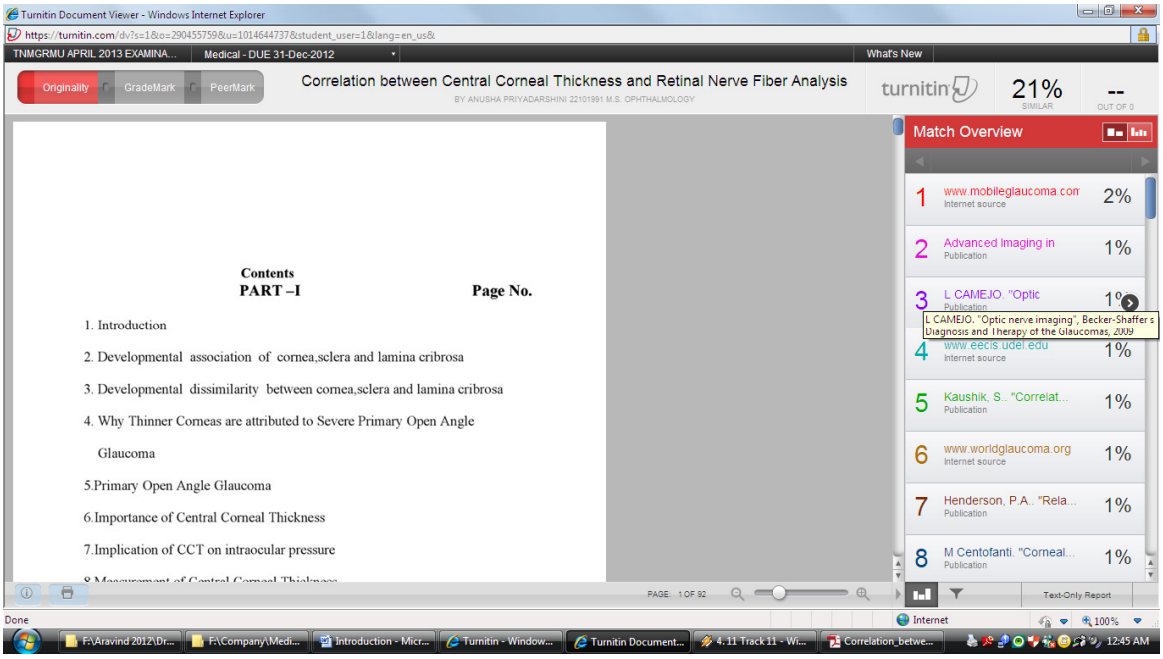
NFI - Nerve Fiber Indicator

CDR - Cup Disc Ratio

OHTS - Ocular Hyertension Treatment Study

SLP VCC- Scanning Laser Polarimetry Variable Corneal Compensator

NTG- Normal Tension Glaucoma.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S NO	NAME	MR. NO	AGE (yrs)	SEX	DIAGNOSIS	EYE	FAMILY HISTORY	DIABETES	HYPERTENSION	TREATMENT HISTORY	UCVA	BCVA	LENS	APPLANATION TN (mmHg)	VERTICAL CDR	CCT (µm)	TSNIT AVG	SUPERIOR AVG	INFERIOR AVG	TSNIT SD	IES	NFI
1	Joseph MO	3111659	60	Male	POAG	RE	No	No	No	No	6/6	6/6	Clear	12	0.85	510	38.5	39.5	50.5	16.6	0.64	60
2	Joseph MO	3111659	60	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	14	0.85	521	31.5	28.5	38.6	8		98
3	Sudhakar rao	3436420	50	Male	POAG Suspect	RE	Yes	No	No	No	6/9	6/6	Lens changes	22	0.75	487	38.3	43.6	49.9	17.6	0.69	48
4	sudhakar rao	3436420	50	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	Lens changes	20	0.8	470	35.2	47.2	36.4	16.9		63
5	Murugandam	2895834	30	Male	POAG Suspect	RE	No	No	No	No	6/36	6/6	Clear	22	0.7	576	52.5	57.3	75.2	31.4	0.95	25
6	Murugandam	2895834	30	Male	POAG Suspect	LE	No	No	No	No	6/36	6/6	Clear	22	0.75	560	54.9	63.3	76.4	33.6		21
7	Vetrisehan	3109575	67	Male	POAG	RE	No	Yes	Yes	No	6/18	6/12	Lens changes	16	0.75	535	50.3	71.7	50.2	23.5	0.91	26
8	Vetrisehan	3109575	67	Male	POAG	LE	No	No	No	No	6/12	6/9	Lens changes	14	0.7	539	51.9	73.1	57.3	26.6		18
9	Selva Kumari	1198884	56	Female	POAG	RE	No	No	No	No	6/6	6/6	PCIOL	14	0.8	535	43.2	39.8	46.8	12.5	0.14	48
10	Selva Kumari	1198884	56	Female	POAG	LE	No	No	No	No	6/6	6/6	PCIOL	13	0.75	527	47.4	64.3	52.2	22.5		24
11	Kalaiarasu	2371664	48	Male	POAG Suspect	RE	Yes	Yes	No	No	6/6	6/6	Clear	16	0.7	548	47	58.9	55.8	21.3	0.9	24
12	Kalaiarasu	2371664	48	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	18	0.7	549	44.6	55.9	55.3	22.1		28
13	Saroja	2128723	55	Female	POAG Suspect	RE	No	Yes	Yes	No	6/60	6/6	Lens changes	20	0.65	535	51.6	57.1	55.3	22.1	0.91	15
14	Saroja	2128723	55	Female	POAG Suspect	LE	No	No	No	No	6/60	6/6	Lens changes	14	0.6	551	50	60.7	51.4	23.5		21
15	Gupta KSR	3108846	60	Male	POAG Suspect	RE	No	No	No	No	6/12	6/6	Lens changes	16	0.75	617	45.6	47	49.8	9.8	0.8	50
16	Gupta KSR	3108846	60	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	Lens changes	15	0.65	617	51.3	61.6	54.2	21.3		27
17	Vasadharajan R	2266272	60	Male	POAG	RE	No	No	Yes	No	6/8	6/6	Lens changes	16	0.65	534	57.6	70.9	69.7	26.9	0.92	11
18	Vasadharajan R	2266272	60	Male	POAG	LE	No	No	No	No	6/6	6/6	Lens changes	14	0.75	535	53.2	70	62.9	26		17
19	Hussain	311128	49	Male	POAG Suspect	RE	No	No	Yes	No	6/6	6/6	Clear	20	0.65	535	56.1	69.2	67	28.3	0.91	14
20	Hussain	311128	49	Male	POAG Suspect	LE	No	No	No	No	6/9	6/9	Clear	20	0.65	579	51.9	66.6	62.7	26.7		21
21	Salitha B	3085976	52	Female	POAG Suspect	RE	No	No	No	No	6/24	6/6	Clear	32	0.7	628	49	62.1	57.6	18.9	0.89	27
22	Salitha B	3085976	52	Female	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	20	0.5	628	62.5	72.9	78.4	27.6		6
23	Srinivasan	2186341	49	Male	POAG Suspect	RE	Yes	No	No	No	6/9	6/6	Clear	17	0.7	486	54.3	65.8	60.5	24.6	0.93	13
24	Srinivasan	2186341	49	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	14	0.6	486	54.7	68.8	63.2	26.3		13
25	Ganga AM	3106772	58	Female	POAG	RE	No	No	No	No	6/18	6/6	Clear	20	0.65	585	45.4	58	47.5	19.4	0.83	30
26	Ganga AM	3106772	58	Female	POAG	LE	No	No	No	No	6/18	6/9	Clear	17	0.7	588	43.6	48.7	48.3	16.7		39
27	Santhamma	3054043	62	Female	POAG Suspect	RE	No	No	No	No	6/18	6/6	IMC	15	0.7	551	53.7	59.6	47	15.4	0.89	24
28	Santhamma	3054043	62	Female	POAG Suspect	LE	No	No	No	No	6/8	6/6	IMC	16	0.75	552	55.4	56.5	52.9	15.2		24

29	Subramaniam	3431725	60	Male	POAG Suspect	RE	No	Yes	No	No	6/6	6/6	Lens changes	17	0.65	602	64.1	78.3	76.7	28	0.96	9
30	Subramaniam	3431725	60	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Lens changes	15	0.75	601	64.6	76.6	82.1	31.8		2
31	Ramalakshmi	1539269	68	Female	POAG	RE	Yes	No	No	No	6/9	6/6	Lens changes	22	0.75	535	52.9	62.5	57.9	23.6	0.81	13
32	Ramalakshmi	1539269	68	Female	POAG	LE	No	No	No	No	6/9	6/6	Clear	20	0.7	535	51.9	62.1	61.3	27.1		18
33	Vellaichamy	3343024	70	Male	POAG	RE	No	No	No	No	6/12	6/6	Lens changes	14	0.9	554	46.1	54.8	50.5	13.8	0.71	29
34	Vellaichamy	3343024	70	Male	POAG	LE	No	No	No	No	6/18	6/6	Lens changes	18	0.9	543	44.9	52	51.6	14.9		32
35	Karunakaran	2760538	65	Male	POAG	RE	No	No	No	No	6/6	6/6	PCIOL	20	0.8	519	33.1	35.1	38.4	9.3	0.6	79
36	Karunakaran	2760538	65	Male	POAG	LE	No	No	No	No	6/9	6/9	IMC	18	0.8	519	39.3	45.4	46.6	13.4		48
37	Vargheese George	3109261	62	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	18	0.6	553	65.6	75.1	80.9	27.6	0.95	12
38	Vargheese George	3109261	62	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	18	0.6	567	57.5	67.1	68.8	22.1		22
39	ndari Venkatachala	2097885	59	Female	POAG	RE	No	No	No	No	6/60	6/9	IMC	12	0.85	486	44	43.7	50.2	8.7	0.55	59
40	ndari Venkatachala	2097885	59	Female	POAG	LE	No	No	No	No	6/60	6/9	IMC	15	0.85	486	44	54.5	47.8	15.2		40
41	Sivakami V	2808826	58	Female	POAG	RE	No	No	Yes	No	6/12	6/6	Clear	14	0.7	584	51	50	65.9	16.6	0.75	36
42	Sivakami V	2808826	58	Female	POAG	LE	No	No	No	No	6/12	6/6	Clear	14	0.75	564	56.9	55.2	76.1	19.6		38
43	Vasuki	3235041	53	Female	POAG Suspect	RE	No	No	No	No	6/6	6/6	PCIOL	14	0.7	486	57	74.2	65.8	25.9	0.24	10
44	Vasuki	3235041	53	Female	POAG Suspect	LE	No	No	No	No	6/12	6/9	IMC	14	0.5	502	76.1	88.3	67.1	50.9		2
45	Prassana	2647614	22	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	17	0.6	567	50	57.4	54.2	15.2	0.72	23
46	Prassana	2647614	22	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	16	0.65	568	46.9	54.4	57.5	19.4		24
47	Velamel Dev	3106418	63	Female	POAG	RE	Yes	No	No	No	6/9	6/6	Lens changes	12	0.65	573	49.9	57.7	54.3	18	0.64	19
48	Velamel Dev	3106418	63	Female	POAG	LE	No	No	No	No	6/12	6/6	Lens changes	12	0.85	568	43.4	49.2	49.6	19.2		33
49	Santhakumar	3093170	51	Male	POAG	RE	No	No	No	No	6/60	6/6	Clear	20	0.75	545	47.4	41.8	57.7	19.9	0.69	37
50	Santhakumar	3093170	51	Male	POAG	LE	No	No	No	No	6/36	6/6	Clear	20	0.7	552	50.4	55.4	63.9	22.3		21
51	Clara Albert	3102687	36	Female	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	18	0.75	543	42	48.2	45.7	12.9	0.91	46
52	Clara Albert	3102687	36	Female	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	18	0.65	530	45.8	54.8	54	23.1		31
53	Indu Rajasekar	8037297	66	Female	POAG	RE	No	No	No	No	6/12	6/9	Clear	15	0.75	503	46.6	44.7	51	18.6	0.09	46
54	Indu Rajasekar	8037297	66	Female	POAG	LE	No	No	No	No	6/12	6/9	Clear	16	0.75	502	42.1	50.6	48.9	17.7		55
55	Srirangan	2051627	62	Male	POAG	RE	No	Yes	Yes	No	6/12	6/9	PCIOL	19	0.8	502	49.6	63.7	56.4	23.4	0.85	22
56	Srirangan	2051627	62	Male	POAG	LE	No	No	No	No	6/6	6/9	Lens changes	19	0.6	503	58	73.9	69.4	29.1		10
57	Fathima Jinnah	2280533	45	Female	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	19	0.65	532	49.9	58.4	54.9	16.3	0.73	24
58	Fathima Jinnah	2280533	45	Female	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	19	0.75	531	51.9	66.9	56	22.6		18
59	Rajendran	2319946	48	Male	POAG	RE	Yes	No	No	No	6/12	6/6	Clear	15	0.6	535	51.2	59.6	54.8	17.3	0.8	21
60	Rajendran	2319946	48	Male	POAG	LE	No	No	No	No	6/18	6/6	Clear	17	0.6	535	49.7	59.1	55.9	16.4		23
61	Geetha	2933176	41	Female	POAG Suspect	RE	Yes	No	No	No	6/9	6/6	Clear	15	0.4	501	65.9	76.4	79.1	24.5	0.82	2
62	Geetha	2933176	41	Female	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	14	0.5	502	66.4	83.9	76.9	30.6		2
63	Annalakshmi	3112669	55	Female	POAG Suspect	RE	No	No	No	No	6/18	6/6	Clear	18	0.5	535	50.7	54	63.4	22.7	0.87	27
64	Annalakshmi	3112669	55	Female	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	18	0.7	535	50.7	57.9	64.1	25.6		29
65	Baskaran	3126831	62	Male	POAG Suspect	RE	No	Yes	Yes	No	6/24	6/9	Lens changes	14	0.7	502	52.6	57	50.5	13.7	0.4	27

66	Baskaran	3126831	62	Male	POAG Suspect	LE	No	No	No	No	6/36	6/6	Lens changes	16	0.7	505	48.4	57.5	56	17.8		34
67	Gomathi	3144036	70	Female	POAG	RE	No	No	No	No	6/36	6/12	PCIOL	12	0.75	522	60	54.9	66.1	10.1	0.55	21
68	Gomathi	3144036	70	Female	POAG	LE	No	No	No	No	6/36	6/18	PCIOL	12	0.6	526	56.3	60.9	64.8	18.1		20
69	Natarajan	3145355	57	Male	POAG	RE	No	No	Yes	No	6/12	6/6	Clear	16	0.8	477	40.8	56.6	32.2	13.6	0.66	43
70	Natarajan	3145355	57	Male	POAG	LE	No	No	No	No	6/18	6/12	Clear	18	0.9	469	48.9	69.8	47.4	23.3		27
71	Sivaprasad V	3146101	42	Male	POAG Suspect	RE	Yes	No	No	No	6/12	6/6	Clear	16	0.75	535	61.7	68.2	79.6	26.3	0.92	15
72	Sivaprasad V	3146101	42	Male	POAG Suspect	LE	No	No	No	No	4/60	6/18	Clear	16	0.6	534	66.9	69.3	89.9	29		11
73	Nabeesa	3150717	63	Female	POAG Suspect	RE	No	No	Yes	No	6/36	6/12	Lens changes	18	0.65	551	52.6	60.2	59.5	20.4	0.83	18
74	Nabeesa	3150717	63	Female	POAG Suspect	LE	No	No	No	No	6/36	6/12	Lens changes	17	0.7	530	57.5	69.3	66.8	25.8		10
75	Avva Beevi V	3151237	55	Female	POAG Suspect	RE	No	No	Yes	No	6/18	6/6	Clear	15	0.6	578	54.6	59	56.7	11.8	0.66	27
76	Avva Beevi V	3151237	55	Female	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	15	0.7	578	54.6	65.6	57.9	20.3		15
77	Chaksavasthi	3152172	67	Male	POAG	RE	No	No	Yes	Yes	6/60	6/6	IMC	15	0.6	535	39	37.9	44.1	7.4	0.53	77
78	Chaksavasthi	3152172	67	Male	POAG	LE	No	No	No	No	6/36	6/9	IMC	16	0.6	535	45.3	56	46.9	12.9		42
79	Valli Natarajan	1701832	53	Female	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	12	0.75	521	56.9	71	59.3	24.8	0.87	5
80	Valli Natarajan	1701832	53	Female	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	12	0.65	524	55.5	65	69.8	30.2		14
81	Subramaniam	3142831	60	Male	POAG	RE	No	No	No	Yes	6/18	6/6	Lens changes	22	0.85	562	38.2	43.1	41.7	13.6	0.81	58
82	Subramaniam	3142831	60	Male	POAG	LE	No	No	No	No	6/24	6/6	Lens changes	22	0.65	577	39.9	44.4	45.3	14.8		54
83	Dhandapani	2553896	56	Male	POAG	RE	No	No	No	Yes	6/60	6/6	PCIOL	12	0.75	502	55.4	54.2	67.3	14	0.81	29
84	Dhandapani	2553896	56	Male	POAG	LE	No	No	No	No	6/18	6/6	IMC	12	0.8	494	51.2	60.9	61.7	21.2		23
85	Kamatchi	2303601	72	Female	POAG	RE	No	No	No	Yes	6/24	6/9	PCIOL	12	0.75	532	38.2	38.4	49.4	17.3	0.93	54
86	Kamatchi	2303601	72	Female	POAG	LE	No	No	No	No	6/12	6/9	PCIOL	15	0.6	530	46.1	47.1	53.4	16.8		35
87	Hajra Praveen	2608224	49	Female	POAG	RE	No	No	No	No	6/60	6/6	Clear	21	0.65	623	45.6	48.4	60.1	18.9	0.79	40
88	Hajra Praveen	2608224	49	Female	POAG	LE	No	No	No	No	6/60	6/6	Clear	18	0.7	636	56.6	72.9	68	27.7		17
89	Rajarajan	3140897	28	Male	POAG Suspect	RE	Yes	No	No	No	6/18	6/6	Clear	20	0.65	557	54.1	59.1	64.4	19.9	0.79	18
90	Rajarajan	3140897	28	Male	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	14	0.8	535	54.8	64	66.2	26.8		20
91	Ganesan	2685593	65	Male	POAG	RE	No	No	No	Yes	6/18	6/6	Lens changes	12	0.7	505	40.1	45	49.1	15	0.95	48
92	Ganesan	2685593	65	Male	POAG	LE	No	No	No	No	6/18	6/6	Lens changes	12	0.5	502	49	56.9	59.4	20.3		27
93	Praba V Jain	3142766	22	Male	POAG	RE	No	No	No	Yes	1/60	6/6	Clear	16	0.7	624	71.2	71	83.8	18		16
94	Mathavan	3119067	48	Male	POAG Suspect	RE	No	No	No	No	6/36	6/6	Clear	21	0.7	618	55.1	65	61.7	17.7	0.9	14
95	Mathavan	3119067	48	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	Clear	24	0.75	587	52.1	66.7	62.2	28.4		17
96	Paritha Beevi	3107586	68	Female	POAG	RE	No	No	No	No	6/12	6/9	Lens changes	19	0.85	578	42	45.8	49.7	13.3	0.77	15.7
97	Paritha Beevi	3107586	68	Female	POAG	LE	No	No	No	No	6/9	6/9	Lens changes	20	0.6	524	71.8	65.5	57.6	19.7		5
98	Lakshmi	3045277	48	Female	POAG Suspect	RE	No	No	Yes	No	6/12	6/9	Lens changes	16	0.75	578	44.7	49.8	53.1	15.1	0.83	32
99	Lakshmi	3045277	48	Female	POAG Suspect	LE	No	No	No	No	6/9	6/9	Lens changes	14	0.65	578	45.8	59	57.6	19.1		27
100	Rahmath	2966961	26	Female	POAG	RE	No	No	No	No	6/24	6/9	Clear	17	0.9	555	28.8	23.8	33.9	5.5	0.6	98
101	Rahmath	2966961	26	Female	POAG	LE	No	No	No	No	6/36	6/9	Clear	20	0.85	535	47.3	49.7	52.7	12.7		89
102	Chellavelu	2855713	55	Female	POAG Suspect	RE	No	No	No	Yes	6/36	6/6	Lens changes	20	0.75	550	45.4	53.2	50.4	15.8	0.69	29

103	Chellavelu	2855713	55	Female	POAG Suspect	LE	No	No	No	No	6/24	6/6	Lens changes	17	0.7	551	55.6	62	70.6	21.7		25
104	Srinivasan	2685755	52	Male	POAG Suspect	RE	Yes	No	No	No	6/9	6/6	Clear	22	0.7	570	46.5	46.6	59.8	19.4	0.8	33
105	Srinivasan	2685755	52	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	22	0.7	518	45.4	48.3	53.9	15.1		44
106	Binildas	3142785	38	Male	POAG Suspect	RE	No	No	No	No	6/12	6/6	Clear	18	0.6	502	55.7	65.5	64.8	21.6	0.93	18
107	Binildas	3142785	38	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	18	0.6	502	55.5	69.1	61	27.2		17
108	Arjunan	298647	73	Male	POAG Suspect	RE	No	No	No	No	6/12	6/9	Lens changes	14	0.65	485	51.9	54.8	53.6	11.9	0.79	28
109	Arjunan	298647	73	Male	POAG Suspect	LE	No	No	No	No	6/9	6/9	Lens changes	14	0.65	485	56	59.5	56.5	19.8		13
110	Renganathan	2066446	64	Male	POAG	RE	No	No	No	No	6/18	6/6	PCIOL	17	0.7	532	40.4	45.1	42.9	10.9	0.45	69
111	Renganathan	2066446	64	Male	POAG	LE	No	No	No	No	6/12	6/6	PCIOL	18	0.75	513	42.9	49.4	48	15.2		52
112	Muthu R	1774439	66	Male	POAG	RE	No	Yes	Yes	Yes	6/12	6/9	PCIOL	21	0.65	580	53.1	59.2	58.1	15.6	0.56	34
113	Muthu R	1774439	66	Male	POAG	LE	No	No	No	No	6/12	6/9	PCIOL	21	0.65	574	69.3	67.8	67.6	18.5		10
114	Beena Rajan	2567097	45	Female	POAG	RE	No	No	No	Yes	6/6	6/6	Clear	20	0.55	568	51.1	60.4	58.2	18.7	0.78	31
115	Beena Rajan	2567097	45	Female	POAG	LE	No	No	No	No	6/6	6/6	Clear	20	0.65	568	56.3	65.3	62	18.4		42
116	Deepak Anand	479465	49	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	18	0.8	521	47.1	50.9	56.5	18.8	0.89	26
117	Deepak Anand	479465	49	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	18	0.7	537	51.1	58.9	56.5	18.1		26
118	Mathina Begum	3134018	30	Female	POAG Suspect	RE	Yes	No	No	No	6/36	6/6	Clear	20	0.65	518	55.2	68.7	64.4	23.4	0.93	18
119	Mathina Begum	3134018	30	Female	POAG Suspect	LE	No	No	No	No	6/24	6/6	Clear	20	0.6	578	54.1	69	63.7	26.8		14
120	Saravanakumar	3104007	44	Male	POAG Suspect	RE	Yes	No	No	No	6/6	6/6	Clear	14	0.6	600	55.5	54.5	64.4	15.6	0.73	22
121	Saravanakumar	3104007	44	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	12	0.6	600	59.4	65.9	44	20.7		25
122	Jainambubeen	2919254	85	Female	POAG Suspect	RE	No	No	No	No	6/24	6/6	PCIOL	22	0.8	545	46.1	49.6	52.5	13.7	0.88	38
123	Jainambubeen	2919254	85	Female	POAG Suspect	LE	No	No	No	No	6/24	6/6	PCIOL	22	0.7	535	45	53.4	53.3	19.2		39
124	Rita Mary	286578	64	Female	POAG Suspect	RE	No	No	No	No	6/8	6/6	Lens changes	22	0.65	568	50.8	57.5	54.1	17.9	0.89	16
125	Rita Mary	286578	64	Female	POAG Suspect	LE	No	No	No	No	6/9	6/6	Lens changes	22	0.6	568	55.5	62.5	63.5	20.2		17
126	Vellaichamy	3156387	67	Male	POAG Suspect	RE	No	No	No	No	6/24	6/6	Clear	15	0.6	479	47.9	52	52.3	16.3	0.61	27
127	Vellaichamy	3156387	67	Male	POAG Suspect	LE	No	No	No	No	6/24	6/6	Clear	15	0.6	492	52.7	58.1	62	19.3		27
128	Murugan	3153869	53	Male	POAG	RE	No	No	Yes	No	6/9	6/6	Clear	19	0.55	578	55.8	71.9	55	25.3	0.87	13
129	Murugan	3153869	53	Male	POAG	LE	No	No	No	No	6/8	6/6	Clear	16	0.55	578	48.2	58.9	54.5	23.4		25
130	Johnson	2832284	57	Male	POAG	RE	No	No	No	Yes	6/18	6/6	Lens changes	25	0.7	502	43.1	44.7	46.7	11.7	0.67	38
131	Johnson	2832284	57	Male	POAG	LE	No	No	No	No	6/18	6/6	Lens changes	25	0.7	521	40.2	42.8	49	15.2		35
132	Ajoy Kumar	2010759	52	Male	POAG	RE	No	Yes	Yes	Yes	6/6	6/18	Lens changes	18	0.6	552	51.7	61.1	61.5	22.2	0.88	31
133	Ajoy Kumar	2010759	52	Male	POAG	LE	No	No	No	No	6/6	6/24	Lens changes	20	0.75	556	41.4	54.3	43.4	21.3		59
134	Puspharaj T	2367532	58	Male	POAG	RE	No	No	No	No	6/6	6/6	PCIOL	20	0.7	534	53.8	59.1	57.2	12.3	0.77	29
135	Puspharaj T	2367532	58	Male	POAG	LE	No	No	No	No	6/6	6/6	PCIOL	16	0.7	537	42.6	46.3	56.2	20.5		47
136	Saleem Ahmed	1821833	35	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Lens changes	22	0.65	519	50.7	58.7	52.8	12.4	0.71	26
137	Saleem Ahmed	1821833	35	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Lens changes	23	0.55	535	49.2	61.5	55.5	19		25
138	Vetrivel	1471331	36	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	24	0.85	568	34.3	43.6	34.4	14.2	0.71	68
139	Vetrivel	1471331	36	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	18	0.8	551	36.9	46.8	36.3	12.8		51

140	Naveen	2864620	32	Male	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	12	0.65	552	50.6	55.5	66.7	21.5	0.83	22
141	Naveen	2864620	32	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	14	0.55	551	56.2	55.8	61.5	18.4		26
142	Mohd. Shaffi	3163427	57	Male	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	16	0.65	491	45.9	60	53.2	21	0.78	28
143	Mohd. Shaffi	3163427	57	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	16	0.7	496	43.5	45.8	53.2	15.7		55
144	Selvarani	3162681	26	Female	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	13	0.75	578	50.7	58.5	62.5	22.3	0.97	20
145	Selvarani	3162681	26	Female	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	12	0.75	578	52.8	62.1	65.4	22.7		19
146	Fathima Hassan	3161276	51	Female	POAG	RE	Yes	No	Yes	No	6/12	6/6	Lens changes	18	0.8	535	38.4	45.9	47.6	16.4	0.64	50
147	Fathima Hassan	3161276	51	Female	POAG	LE	No	No	No	No	6/9	6/6	Lens changes	18	0.75	532	36.8	46.1	34.3	13.7		57
148	Jeyakumar V	3128302	44	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	14	0.7	551	53.6	62.6	62.5	24.3	0.88	16
149	Jeyakumar V	3128302	44	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	16	0.8	555	57.5	57.4	68.5	26.8		18
150	Boominathan	3114299	46	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	16	0.75	552	54.5	61.3	60.9	19.3	0.9	18
151	Boominathan	3114299	46	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	16	0.7	551	58.8	68.5	71.6	26.2		17
152	Karuppaiah	3436812	70	Male	POAG	RE	No	No	No	Yes	6/12	6/6	IMC	18	0.75	502	65.7	75.9	66.5	16.4	0.67	2
153	Karuppaiah	3436812	70	Male	POAG	LE	No	No	No	No	6/36	6/9	IMC	18	0.75	513	57	62.6	55.3	11.6		18
154	Shahir	3067974	50	Male	POAG Suspect	RE	No	Yes	Yes	No	6/6	6/6	Clear	16	0.6	608	55.6	61.8	58.3	13.3	0.68	24
155	Shahir	3067974	50	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	16	0.65	584	50.5	64.2	48.7	17.3		20
156	Kathija Beevi	2931204	60	Female	POAG	RE	No	No	No	Yes	6/9	6/6	PCIOL	12	0.6	502	59.3	67.9	57.3	20.2	0.69	9
157	Kathija Beevi	2931204	60	Female	POAG	LE	No	No	No	No	6/9	6/6	PCIOL	12	0.75	502	56.7	52	70.7	21.5		25
158	Valliapan	2651810	64	Male	POAG	RE	No	No	No	No	6/9	6/9	PCIOL	16	0.75	551	66.1	68.4	63.1	16	0.36	23
159	Valliapan	2651810	64	Male	POAG	LE	No	No	No	No	6/9	6/9	PCIOL	12	0.75	551	64.1	56.4	81.8	17		29
160	Balagurunathan	1778636	41	Male	POAG	RE	No	No	No	No	6/9	6/6	Clear	16	0.75	535	38.2	44.6	37.6	8.9	0.55	62
161	Balagurunathan	1778636	41	Male	POAG	LE	No	No	No	No	6/9	6/6	Clear	18	0.8	532	38.9	45.7	38.8	11.8		52
162	Kamalamma	2483695	50	Female	POAG	RE	Yes	No	No	No	6/9	6/9	Clear	16	0.85	559	37.6	46.3	38.2	16.6	0.94	56
163	Kamalamma	2483695	50	Female	POAG	LE	No	No	No	No	6/6	6/6	Clear	20	0.8	562	42.2	54.1	39.8	15.7		43
164	Asha	2525455	44	Female	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	17	0.65	521	40.2	46.8	54.1	19.2	0.96	48
165	Asha	2525455	44	Female	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	18	0.7	513	37.1	40	44.5	13.8		59
166	Priya Rani	3014538	54	Female	POAG	RE	No	No	No	Yes	5/60	6/18	Lens changes	16	0.6	486	62.4	75.2	76.2	29.4	0.97	6
167	Priya Rani	3014538	54	Female	POAG	LE	No	No	No	No	6/18	6/6	Lens changes	18	0.65	492	57.2	69.5	69.5	28.1		9
168	Kannan	3149786	56	Male	POAG Suspect	RE	No	No	No	No	6/9	6/6	Lens changes	22	0.65	502	51.2	60.4	54.9	19.5	0.88	19
169	Kannan	3149786	56	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Lens changes	20	0.75	503	48.8	59.1	56.7	23.8		24
170	Poonkodi	3099795	52	Female	POAG	RE	No	Yes	No	No	6/60	6/6	Clear	26	0.7	498	43.9	54.7	45.6	17.5	0.64	44
171	Poonkodi	3099795	52	Female	POAG	LE	No	No	No	No	6/60	6/6	Clear	22	0.75	502	40	38	51.3	19		64
172	Baskar	3062783	37	Male	POAG Suspect	RE	No	No	No	No	4/60	6/6	Clear	21	0.75	567	38.6	48.3	37.7	13.1	0.78	46
173	Baskar	3062783	37	Male	POAG Suspect	LE	No	No	No	No	4/60	6/6	Clear	21	0.6	567	52.8	69.6	50.9	20.8		18
174	Balanaga Ganesh	2820369	40	Male	POAG	RE	No	Yes	No	No	6/6	6/6	Clear	16	0.65	565	47.3	41.7	67.2	21.6	0.88	34
175	Balanaga Ganesh	2820369	40	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	18	0.6	535	40.2	34.9	59.1	18.4		61
176	Gopalan	2956689	60	Male	POAG	RE	No	No	No	No	6/6	6/6	Lens changes	20	0.5	552	52.4	56.3	63.8	20.2	0.84	24

177	Gopalan	2956689	60	Male	POAG	LE	No	No	No	No	6/6	6/6	Lens changes	16	0.65	551	48.6	57.2	51	21		27
178	Jontha Sr	3007132	49	Female	POAG	RE	No	No	No	Yes	6/24	6/9	Clear	21	0.85	574	33.8	43.3	27.5	9.8	0.15	81
179	Jontha Sr	3007132	49	Female	POAG	LE	No	No	No	No	6/24	6/9	Clear	16	0.65	586	43	50.2	43.4	12.1		55
180	Vijayalakshmi	3159002	57	Female	POAG	RE	Yes	No	No	No	6/9	6/9	Lens changes	18	0.7	480	53.9	57.2	59.2	19.1	0.8	23
181	Vijayalakshmi	3159002	57	Female	POAG	LE	No	No	No	No	6/9	6/9	Lens changes	16	0.7	485	45.9	47.2	50.7	13.1		37
182	Janaki	3163612	50	Female	POAG	RE	No	Yes	No	No	6/9	6/6	Clear	18	0.8	548	42.2	56.9	44.3	18.5	0.95	45
183	Janaki	3163612	50	Female	POAG	LE	No	No	No	No	6/9	6/6	Clear	18	0.75	525	41.6	54.7	41	15.8		49
184	Pandirajan	2570425	45	Male	POAG Suspect	RE	No	No	No	No	6/12	6/6	Clear	14	0.5	521	50.4	59.8	50.4	15.8	0.66	18
185	Pandirajan	2570425	45	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	14	0.65	526	43.9	56.1	44.2	16.2		34
186	Syed Ibrahim A	2155998	50	Male	POAG Suspect	RE	No	No	No	No	6/24	6/6	Clear	14	0.65	501	48.3	59.9	51.5	19.9	0.91	21
187	Syed Ibrahim A	2155998	50	Male	POAG Suspect	LE	No	No	No	No	6/24	6/6	Clear	14	0.7	502	44.2	52.2	43.9	16.4		28
188	enkata Subramania	2155872	36	Male	POAG	RE	No	No	No	Yes	6/60	6/6	Clear	28	0.75	546	53.1	64.2	56.8	20.2	0.67	13
189	enkata Subramania	2155872	36	Male	POAG	LE	No	No	No	No	6/36	6/6	Clear	24	0.7	499	53.7	68.9	58.5	22.3		16
190	Sugatha	3140450	53	Female	POAG	RE	No	No	No	No	6/36	6/9	Lens changes	21	0.85	600	36.5	29.1	40.3	10.5	0.16	64
191	Sugatha	3140450	53	Female	POAG	LE	No	No	No	No	6/24	6/6	Lens changes	22	0.75	601	44.6	42	64.3	18.5		46
192	Anup Kumar Gupta	3140387	58	Male	POAG	RE	No	Yes	No	No	6/9	6/6	Lens changes	22	0.55	600	47.9	52.1	48.8	11.1	0.76	29
193	Anup Kumar Gupta	3140387	58	Male	POAG	LE	No	No	No	No	6/9	6/6	Lens changes	20	0.55	585	52.2	65.8	56.7	26.5		19
194	Sundarambal	3139619	75	Female	POAG Suspect	RE	No	No	Yes	No	6/24	6/12	IMC	14	0.65	535	65.4	58.8	78	13.1	0.79	17
195	Sundarambal	3139619	75	Female	POAG Suspect	LE	No	No	No	No	6/12	6/9	IMC	18	0.6	532	69.1	55.5	85.6	17		15
196	Thamarai	3126377	61	Female	POAG	RE	No	No	No	No	5/60	6/6	Lens changes	12	0.8	546	38.2	42.3	40.8	8.9	0.46	62
197	Thamarai	3126377	61	Female	POAG	LE	No	No	No	No	4/60	6/9	Lens changes	13	0.6	532	41.2	46	43.3	11.4		50
198	Mathu VVC	3124971	58	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	12	0.75	551	55.3	68.1	69.1	28.5	0.57	14
199	Mathu VVC	3124971	58	Male	POAG Suspect	LE	No	No	No	No	6/60	6/6	Clear	12	0.7	551	39.8	44.7	45.1	11.3		67
200	Sudalaimuthu	3093137	59	Male	POAG	RE	No	No	No	No	6/36	6/9	Lens changes	20	0.65	551	55.8	60.6	59.6	23.6	0.92	16
201	Sudalaimuthu	3093137	59	Male	POAG	LE	No	No	No	No	6/24	6/6	Lens changes	20	0.75	535	55.8	68	63.4	31		15
202	Jeyapal	3059231	63	Male	POAG Suspect	RE	No	No	No	No	2/60	6/18	IMC	12	0.7	535	56.4	65.1	62.3	16.6	0.83	28
203	Jeyapal	3059231	63	Male	POAG Suspect	LE	No	No	No	No	6/9	6/9	Lens changes	14	0.5	535	55.7	71.6	67.6	31		12
204	Emmanuvel	3046533	53	Male	POAG	RE	No	No	No	No	6/12	6/6	Lens changes	22	0.85	519	48.7	49.5	49.3	7.9	0.71	41
205	Emmanuvel	3046533	53	Male	POAG	LE	No	No	No	No	6/12	6/6	Lens changes	20	0.95	535	54.8	63.6	61.8	20		19
206	Annamalai	2963114	75	Male	POAG	RE	No	Yes	No	No	6/36	6/9	Lens changes	16	0.75	513	54.9	51.9	56.2	9.5	0.1	35
207	Annamalai	2963114	75	Male	POAG	LE	No	No	No	No	6/36	6/9	Lens changes	16	0.75	508	50.7	52.7	53.1	13.3		54
208	James	2818322	46	Male	POAG	RE	No	Yes	No	No	6/9	6/6	Clear	18	0.85	551	48	56.8	54	17.7	0.79	34
209	James	2818322	46	Male	POAG	LE	No	No	No	No	6/12	6/9	Clear	15	0.85	535	49.8	61.4	57.6	21.6		28
210	George Mathew	3133826	55	Male	POAG	RE	No	No	No	No	6/36	6/18	IMC	20	0.8	613	69.3	74.8	64.8	19.2	0.31	6
211	George Mathew	3133826	55	Male	POAG	LE	No	No	No	No	6/6	6/6	Lens changes	18	0.7	613	42.6	44.4	51.5	14		54
212	Celin Kurain	3134463	42	Male	POAG	RE	No	No	No	Yes	6/9	6/6	Clear	19	0.95	551	27.8	28.5	31.4	5.3	0.76	98
213	Celin Kurain	3134463	42	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	16	0.6	582	49.1	61.9	60.5	26.3		23

214	Bose N	3050219	51	Male	POAG Suspect	RE	No	No	No	No	6/12	6/6	Lens changes	16	0.75	535	49.2	55.9	60.3	24.2	0.79	26
215	Bose N	3050219	51	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	Lens changes	17	0.65	534	55.7	72.8	66.2	31		13
216	Petchi Muthu	3094550	55	Male	POAG Suspect	RE	No	Yes	Yes	No	6/9	6/6	Clear	16	0.6	557	53.8	64.6	62.7	24.4	0.95	25
217	Petchi Muthu	3094550	55	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	Clear	18	0.65	557	55.7	72.9	63.6	27		26
218	Sudhakar	3130260	34	Male	POAG Suspect	RE	Yes	No	No	No	6/9	6/6	Clear	12	0.65	564	41.7	42	49.8	13.1	0.68	48
219	Sudhakar	3130260	34	Male	POAG Suspect	LE	No	No	No	No	6/9	6/9	Clear	12	0.65	568	47.1	48.1	58.1	19.1		40
220	Karupiah	3051304	59	Male	POAG Suspect	RE	No	No	Yes	No	6/18	6/6	Lens changes	18	0.5	502	48.5	53.9	53.8	16.8	0.72	28
221	Karupiah	3051304	59	Male	POAG Suspect	LE	No	No	No	No	6/18	6/6	Lens changes	21	0.6	578	55.1	54.2	60.4	14.1		32
222	Mariamal	3133568	48	Female	POAG	RE	No	No	No	No	6/36	6/9	Clear	12	0.65	518	54.4	65.9	64	25.2	0.91	12
223	Mariamal	3133568	48	Female	POAG	LE	No	No	No	No	6/18	6/6	Clear	12	0.65	535	52.7	66.1	61.9	23		13
224	Ganesh	2932919	33	Male	POAG	RE	No	No	No	No	6/9	6/6	Clear	24	0.8	568	41.8	64	34.5	20.8	0.93	34
225	Ganesh	2932919	33	Male	POAG	LE	No	No	No	No	6/9	6/6	Clear	18	0.7	568	47.7	70.1	46.1	24.1		22
226	Malaimani	7970040	62	Female	POAG Suspect	RE	No	No	No	No	6/9	6/6	PCIOL	12	0.65	534	46.1	50.9	46.6	17.5	0.75	26
227	Malaimani	7970040	62	Female	POAG Suspect	LE	No	No	No	No	6/18	6/9	IMC	14	0.7	553	50.6	56.5	64.7	26.1		26
228	Pankajam	2816229	60	Female	POAG	RE	No	No	No	Yes	6/36	6/12	PCIOL	24	0.75	621	65.2	62.1	68	18.2	0.89	22
229	Pankajam	2816229	60	Female	POAG	LE	No	No	No	No	6/9	6/6	PCIOL	23	0.7	642	54.5	65.1	69.2	27.4		18
230	Senthil	2137994	44	Male	POAG	RE	No	No	No	No	1/60	6/18	Clear	15	0.9	550	53.3	60.7	61.8	18.7	0.77	34
231	Senthil	2137994	44	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	15	0.7	535	42.7	47.9	56.7	22.1		44
232	Rajagopal	3115198	60	Male	POAG	RE	No	No	No	No	6/12	6/12	Lens changes	20	0.65	600	57	62.8	60.4	17.2	0.46	33
233	Rajagopal	3115198	60	Male	POAG	LE	No	No	No	No	6/12	6/6	Lens changes	18	0.75	600	57.5	62.4	51.3	19.5		27
234	Ramakrishnan	1450739	58	Male	POAG	RE	No	No	No	No	6/9	6/6	Clear	14	0.7	486	36.2	41.4	37.6	11.9	0.69	60
235	Ramakrishnan	1450739	58	Male	POAG	LE	No	No	No	No	6/9	6/6	Clear	15	0.8	496	39.3	43.6	47.1	15.4		66
236	Muni Subramaniam	3074779	43	Male	POAG	RE	No	No	No	Yes	6/9	6/6	Clear	18	0.65	557	43.6	47	47.4	11.4	0.62	53
237	Muni Subramaniam	3074779	43	Male	POAG	LE	No	No	No	No	6/24	6/9	Clear	18	0.7	550	36.4	41.2	46	15.2		66
238	Karupiah	3067239	60	Male	POAG Suspect	RE	No	No	No	No	6/9	6/6	Lens changes	13	0.75	578	49.5	63.2	58.9	23.7	0.93	22
239	Karupiah	3067239	60	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	IMC	15	0.7	534	45.7	57.9	47.4	16.1		34
240	Sudakar	3055419	43	Male	POAG	RE	No	No	No	No	6/12	6/6	Clear	14	0.75	535	43.9	58.7	42.3	19.2	0.93	25
241	Sudakar	3055419	43	Male	POAG	LE	No	No	No	No	6/9	6/6	Clear	16	0.7	534	48.5	66.6	48.2	23.2		21
242	Inbavalli	2294479	50	Female	POAG Suspect	RE	No	No	No	No	6/24	6/9	Lens changes	20	0.75	535	50.1	62.1	42.2	14.9	0.79	21
243	Inbavalli	2294479	50	Female	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	18	0.75	519	50.9	64.4	48.4	18.3		19
244	Vargheese PA	1976679	46	Male	POAG	RE	No	No	No	No	5/60	6/9	Lens changes	19	0.75	535	62.1	66.5	65.5	12.4	0.62	26
245	Vargheese PA	1976679	46	Male	POAG	LE	No	No	No	No	5/60	6/9	Lens changes	15	0.9	557	52.9	50	62.2	12.8		42
246	Perumal	1648175	60	Male	POAG	RE	No	No	No	Yes	6/12	6/9	PCIOL	12	0.7	535	55.2	58.5	62.3	16	0.79	23
247	Perumal	1648175	60	Male	POAG	LE	No	No	No	No	6/12	6/9	PCIOL	14	0.8	535	58.3	62.1	60.6	10.6		20
248	Ranjitham	2786828	70	Female	POAG Suspect	RE	No	No	No	Yes	6/18	6/6	PCIOL	16	0.6	518	54.8	61.4	57.4	13.4	0.83	18
249	Ranjitham	2786828	70	Female	POAG Suspect	LE	No	No	No	No	6/12	6/6	PCIOL	15	0.65	524	58.9	72.9	63.2	27.1		12
250	Krishnama Chayarul	3086597	50	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	IMC	16	0.6	550	42.7	52.8	50	17.4	0.73	39

251	Krishnama Chayarul	3086597	50	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	IMC	20	0.65	583	47.5	59.2	56.3	20.4		26
252	Kalpanasaha	3130251	75	Female	POAG Suspect	RE	No	No	Yes	No	6/18	6/6	Lens changes	12	0.7	534	55.8	60.6	57	15.6	0.41	25
253	Kalpanasaha	3130251	75	Female	POAG Suspect	LE	No	No	No	No	6/18	6/6	Lens changes	12	0.7	534	55.5	57.6	58.7	12.9		20
254	Arahunsha	3127276	47	Female	POAG Suspect	RE	No	No	No	No	2/60	6/12	Clear	12	0.6	551	88.3	80.9	103.5	18.9	0.14	4
255	Arahunsha	3127276	47	Female	POAG Suspect	LE	No	No	No	No	3/60	6/12	Clear	14	0.75	551	65.1	69.1	75.8	21.7		23
256	Karunakaran Pillai	3114651	73	Male	POAG Suspect	RE	No	No	No	No	6/36	6/9	IMC	13	0.7	535	57.6	56.1	68.1	13.6	0.47	24
257	Karunakaran Pillai	3114651	73	Male	POAG Suspect	LE	No	No	No	No	6/36	6/12	IMC	13	0.7	547	62.8	71.4	69.7	17.7		22
258	Kathirvel Raman	3113918	30	Male	POAG	RE	No	No	No	Yes	6/6	6/6	Clear	20	0.5	584	46.7	58.3	52.3	17	0.71	26
259	Kathirvel Raman	3113918	30	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	29	0.75	584	39.9	41.6	53.1	16.1		58
260	Selvaraj	3106883	57	Male	POAG Suspect	RE	No	Yes	Yes	No	6/18	6/6	Clear	27	0.5	586	50.7	58.6	60.3	19.2	0.91	28
261	Selvaraj	3106883	57	Male	POAG Suspect	LE	No	No	No	No	6/36	6/6	Clear	27	0.4	601	51.1	65.3	61.8	23.2		22
262	Kalpataru Das	3118339	62	Male	POAG Suspect	RE	No	No	No	No	6/12	6/6	Lens changes	18	0.75	583	44	54.5	49.2	20.1	0.82	46
263	Kalpataru Das	3118339	62	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Lens changes	18	0.75	568	46.6	63	55.2	23.8		26
264	Karuppiah	2256289	60	Female	POAG	RE	No	No	No	No	6/18	6/9	Lens changes	20	0.7	502	38.6	43.6	42	11.2	0.45	55
265	Karuppiah	2256289	60	Female	POAG	LE	No	No	No	No	6/6	6/6	Lens changes	23	0.8	502	30.7	40.1	31.2	13.2		84
266	Banumathi	2101832	53	Female	POAG	RE	Yes	No	No	No	6/36	6/6	Clear	17	0.6	578	58.8	63.1	69	19.1	0.8	9
267	Banumathi	2101832	53	Female	POAG	LE	No	No	No	No	6/60	6/6	Clear	16	0.7	508	61.5	75.1	69	24.7		5
268	Balayan	2364683	69	Male	POAG	RE	No	No	No	No	6/12	6/6	Lens changes	16	0.6	519	57.1	74.3	60.2	24.9		14
269	Girija Dhanasekaran	1620740	54	Female	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	15	0.65	536	44	46.8	45.5	14.8	0.79	29
270	Girija Dhanasekaran	1620740	54	Female	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	15	0.65	536	47	53	51.8	17		30
271	Srinivasan	3112852	58	Male	POAG Suspect	RE	No	Yes	No	No	6/24	6/6	Clear	12	0.7	535	68.2	65.6	86.1	19.4	0.76	17
272	Srinivasan	3112852	58	Male	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	12	0.75	535	49.1	63.7	60.5	24.6		24
273	Palanisamy	3118117	56	Male	POAG	RE	No	No	Yes	No	6/6	6/6	Clear	22	0.8	514	40	53.2	36.6	15.7	0.52	41
274	Palanisamy	3118117	56	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	22	0.8	502	41.5	39.7	48.5	15.1		38
275	Kesavarao	3034252	48	Male	POAG	RE	No	No	No	Yes	6/36	6/6	Clear	17	0.8	505	52.5	66.7	56.4	19.4	0.9	19
276	Kesavarao	3034252	48	Male	POAG	LE	No	No	No	No	6/24	6/6	Clear	13	0.8	504	57	75.7	67.9	28.4		7
277	Manikandan JK	3117332	46	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	12	0.5	527	59.9	68.1	74.7	27.3	0.96	14
278	Manikandan JK	3117332	46	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	12	0.7	519	55.5	65.3	67.4	27.3		19
279	Naseer Khan	3116577	56	Male	POAG	RE	Yes	No	No	Yes	6/18	6/6	Clear	18	0.6	583	50.8	61.7	51.4	17	0.78	22
280	Naseer Khan	3116577	56	Male	POAG	LE	No	No	No	No	6/18	6/6	Clear	17	0.5	616	53.8	57.9	64.8	22.2		19
281	Umrala Begam J	3110105	45	Male	POAG Suspect	RE	No	Yes	No	No	6/9	6/6	Clear	18	0.7	587	56	56.6	60.1	12	0.45	24
282	Umrala Begam J	3110105	45	Male	POAG Suspect	LE	No	No	No	No	6/9	6/9	Clear	20	0.65	597	52.6	56.2	60.6	15.2		30
283	Shanmugam	3120613	50	Male	POAG	RE	No	No	No	Yes	5/60	6/9	Clear	16	0.85	494	44.5	45.2	48.2	10.9	0.63	71
284	Shanmugam	3120613	50	Male	POAG	LE	No	No	No	No	5/60	6/6	Clear	12	0.85	512	49.5	50.8	61.9	18.5		28
285	Emani Bhulakshmi	3120008	48	Female	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	14	0.75	510	28.7	27.7	35.9	9.9	0.36	97
286	Emani Bhulakshmi	3120008	48	Female	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	14	0.8	513	25.6	31	25.1	9.1		98
287	Rajendran	2817507	64	Male	POAG Suspect	RE	No	No	No	No	6/18	6/9	Lens changes	16	0.65	579	52.2	64.6	54.8	20.2	0.81	15

288	Rajendran	2817507	64	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Lens changes	16	0.65	519	49.8	58.2	54.3	19		15
289	Boominathan	2929665	52	Male	POAG Suspect	RE	No	No	No	No	6/12	6/6	Clear	20	0.75	519	45.5	57.3	52.7	19.4	0.9	31
290	Boominathan	2929665	52	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	Clear	20	0.65	519	49.9	59.8	61.9	23.6		22
291	Perumalsamy	1306011	74	Male	POAG	LE	No	No	No	No	6/12	6/6	PCIOL	20	0.6	535	47.8	53	54.5	15.4		58
292	Jacob John	1882939	48	Male	POAG Suspect	RE	No	No	No	Yes	6/9	6/6	Lens changes	22	0.5	535	52.8	65.8	61.8	28.2	0.96	25
293	Jacob John	1882939	48	Male	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	24	0.65	554	51	61.9	64.1	30.9		27
294	Shahul Hameed	3119154	33	Male	POAG Suspect	RE	Yes	No	No	No	6/12	6/6	Clear	24	0.7	542	50.9	53.4	58.4	17.6	0.76	18
295	Shahul Hameed	3119154	33	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Lens changes	24	0.75	541	51.3	57	57.9	15.4		22
296	Selvanose	2685747	66	Male	POAG	RE	No	Yes	No	No	6/36	6/6	Lens changes	20	0.65	582	47	51.9	56.2	18.9	0.86	28
297	Selvanose	2685747	66	Male	POAG	LE	No	No	No	No	6/36	6/6	Clear	17	0.7	586	46.6	53	60.1	22.9		28
298	Ganesh Kanna	3060321	38	Male	POAG Suspect	RE	No	No	No	No	6/18	6/6	Clear	17	0.75	534	49	53.3	53.7	15	0.69	28
299	Ganesh Kanna	3060321	38	Male	POAG Suspect	LE	No	No	No	No	6/9	6/9	Clear	14	0.5	535	49.9	58.9	56.8	18.2		28
300	Palanichamy	3120849	64	Male	POAG	RE	No	No	No	No	6/9	6/6	Lens changes	18	0.7	588	48.9	54.4	53.8	13.8	0.54	40
301	Palanichamy	3120849	64	Male	POAG	LE	No	No	No	No	6/9	6/6	Lens changes	16	0.5	584	50.2	54.4	32	10.3		34
302	Venkateswaran	375779	40	Male	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	19	0.55	543	68.4	79.2	81.9	26.9	0.85	8
303	Venkateswaran	375779	40	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	20	0.65	545	66.6	72.8	79.8	22.8		21
304	Farooq	2811973	57	Male	POAG	LE	No	No	No	No	6/18	6/6	Clear	20	0.65	470	49.2	57.4	56.3	19.8		23
305	Mathew Jacob	2906122	47	Male	POAG	RE	No	No	No	No	6/60	6/6	Clear	34	0.7	584	117.7	122.7	107.8	17.7	0.89	2
306	Mathew Jacob	2906122	47	Male	POAG	LE	No	No	No	No	4/60	6/6	Clear	41	0.85	584	59.3	65.8	53.7	16.4		14
307	Ambujam	2932117	61	Female	POAG	RE	No	No	No	Yes	6/6	6/6	Clear	17	0.6	497	45.6	51.5	57	23.1	0.87	46
308	Ambujam	2932117	61	Female	POAG	LE	No	No	No	No	6/6	6/6	Clear	15	0.7	502	40.3	42.8	46.3	15		62
309	Kannan	2941593	60	Male	POAG	RE	No	No	No	No	6/24	6/6	Lens changes	17	0.7	568	43.2	51.2	46.8	19.3	0.72	38
310	Kannan	2941593	60	Male	POAG	LE	No	No	No	No	6/24	6/9	Lens changes	18	0.65	584	36.9	46.6	31.7	13.6		57
311	Rajaram	2955908	58	Male	POAG	RE	No	No	No	No	6/12	6/6	Clear	20	0.7	551	49.9	53.5	51.1	14.2	0.56	23
312	Rajaram	2955908	58	Male	POAG	LE	No	No	No	No	6/12	6/6	Clear	18	0.6	551	65.9	78.5	80	32.6		6
313	Ramachandran	2958542	55	Male	POAG	RE	No	No	No	No	6/12	6/6	Clear	18	0.65	535	56.2	62.5	60.5	14.2	0.84	24
314	Ramachandran	2958542	55	Male	POAG	LE	No	No	No	No	6/12	6/6	Clear	15	0.7	535	56.3	67.4	58.8	20.4		16
315	Ponveeramani	2696212	30	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	18	0.75	590	49.6	61.6	54.8	22.7	0.82	24
316	Ponveeramani	2696212	30	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	17	0.7	581	46.6	55.4	56.9	20.7		33
317	Kishore P N V M	2953458	29	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	19	0.7	535	46.1	47.6	54.2	14.8	0.67	29
318	Kishore P N V M	2953458	29	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	19	0.65	551	47.7	57.6	60.9	22.9		26
319	Sabitha	3285529	48	Female	POAG Suspect	RE	No	No	No	No	6/60	6/24	Clear	22	0.65	545	47.4	51.5	49.5	13.2	0.51	25
320	Sabitha	3285529	48	Female	POAG Suspect	LE	No	No	No	No	6/24	6/9	Clear	18	0.65	552	55.8	63.3	70.1	22.2		22
321	Ashok Kumar	3286861	36	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	19	0.65	551	52.9	64.3	60.6	18.5	0.92	15
322	Ashok Kumar	3286861	36	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	18	0.6	565	56.7	73.2	61.8	21.8		13
323	Dhanalakshmi	3241168	48	Male	POAG	RE	No	No	No	Yes	6/18	6/6	Clear	16	0.6	539	50.9	59.8	58.9	22.7	0.83	17
324	Dhanalakshmi	3241168	48	Male	POAG	LE	No	No	No	No	6/24	6/6	Clear	17	0.7	539	48.5	53.7	57.7	16.1		43

325	Shakunthala	3177604	47	Female	POAG Suspect	RE	No	No	No	No	6/18	6/12	IMC	18	0.75	485	56.1	58.6	55.7	12.1	0.46	35
326	Shakunthala	3177604	47	Female	POAG Suspect	LE	No	No	No	No	6/12	6/6	PCIOL	18	0.8	481	49.1	58.8	50.9	14.6		33
327	Balakrishnan	3120790	48	Male	POAG	RE	No	No	No	Yes	6/6	6/6	Clear	16	0.8	512	38	42.6	44.8	15.3		49
328	Anbalagan	3083026	47	Male	POAG	RE	No	No	No	No	6/9	6/6	Lens changes	19	0.8	576	49.9	59.1	50.1	20.8	0.74	25
329	Anbalagan	3083026	47	Male	POAG	LE	No	No	No	No	6/12	6/6	Lens changes	18	0.6	506	56.1	60.8	63.1	15.7		25
330	Meenakshi	3190788	64	Female	POAG	RE	No	No	No	No	6/24	6/12	PCIOL	18	0.7	579	52.3	69.1	50.9	20.5	0.87	17
331	Meenakshi	3190788	64	Female	POAG	LE	No	No	No	No	6/12	6/6	Lens changes	16	0.65	579	64.5	83.6	73.3	33.4		5
332	Rajarao	3288821	56	Male	POAG	RE	No	No	No	No	6/6	6/6	Clear	16	0.75	584	52.8	59.2	57	13.7	0.02	20
333	Rajarao	3288821	56	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	16	0.85	568	48.7	51.5	51.9	14.4		68
334	Sekar T	3289539	53	Male	POAG Suspect	RE	No	Yes	No	No	6/6	6/6	PCIOL	28	0.6	608	57.8	58.1	67	15.3	0.69	19
335	Sekar T	3289539	53	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	PCIOL	22	0.5	612	62.9	70.1	79.9	24.8		19
336	Aruna S	3290978	26	Female	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	19	0.6	599	61.3	68.3	43.5	19.8	0.28	10
337	Aruna S	3290978	26	Female	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	18	0.5	607	53.3	64.5	59.2	17		21
338	Mohamed Jaufel	3292404	20	Male	POAG Suspect	RE	No	No	No	No	6/36	6/6	Clear	17	0.65	551	57.4	62.6	70.3	22.6	0.55	16
339	Mohamed Jaufel	3292404	20	Male	POAG Suspect	LE	No	No	No	No	6/36	6/6	Clear	19	0.75	541	38.9	34.5	52.8	15.8		62
340	Elumalai	3274207	35	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	12	0.7	487	37.7	39.4	47.3	16.8	0.83	52
341	Elumalai	3274207	35	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	14	0.75	486	36.3	41.2	38.7	12.7		64
342	Govindarajan	3254829	27	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	23	0.8	511	52.8	59.2	64.6	22.9	0.95	24
343	Govindarajan	3254829	27	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	26	0.85	517	55.5	57.8	71	24.5		24
344	Anand Kumar	3293520	37	Male	POAG	RE	No	No	No	Yes	6/60	6/18	Clear	20	0.7	617	40.9	47	44	13.6	0.82	51
345	Anand Kumar	3293520	37	Male	POAG	LE	No	No	No	No	6/36	6/6	Clear	18	0.75	618	40.5	47.2	50.7	19.4		50
346	Premavathy Ragavar	3293707	62	Female	POAG Suspect	RE	Yes	Yes	No	No	6/9	6/6	Clear	24	0.5	591	58.1	74.6	63.9	23.6	0.85	11
347	Premavathy Ragavar	3293707	62	Female	POAG Suspect	LE	No	No	No	No	6/12	6/9	Clear	22	0.5	587	54.9	66.3	61.5	19.7		19
348	Subulakshmi	3294242	53	Female	POAG	RE	Yes	Yes	No	Yes	6/9	6/18	Clear	20	0.7	557	53.7	64.9	64.7	26.9	0.7	21
349	Subulakshmi	3294242	53	Female	POAG	LE	No	No	No	No	6/6	6/12	Clear	18	0.7	557	52.5	56.1	53.4	11.5		29
350	Kousalya	3294629	68	Female	POAG	RE	Yes	No	No	No	6/18	6/6	Lens changes	16	0.7	535	47.9	47.8	52.8	10.8	0.48	29
351	Kousalya	3294629	68	Female	POAG	LE	No	No	No	No	6/36	6/6	Lens changes	16	0.6	531	46.3	55.9	52	19.1		36
352	Munisamy	2111547	67	Male	POAG Suspect	RE	No	No	No	Yes	6/9	6/6	Clear	20	0.5	556	67.9	79.8	74.2	23	0.88	7
353	Munisamy	2111547	67	Male	POAG Suspect	LE	No	No	No	No	6/18	6/9	Clear	26	0.6	562	63.9	82.4	70.6	27		12
354	Suresh Varghesse	241894	61	Male	POAG Suspect	RE	No	No	No	No	6/24	6/12	Lens changes	14	0.55	502	43.6	50	54.4	20	0.92	33
355	Suresh Varghesse	241894	61	Male	POAG Suspect	LE	No	No	No	No	6/18	6/9	Lens changes	14	0.6	502	44.3	51.7	53	19.4		29
356	Rajendra Kumar	3294840	49	Male	POAG	RE	Yes	Yes	No	No	6/6	6/6	Clear	14	0.7	506	49.1	58.3	57.9	22.7	0.93	24
357	Rajendra Kumar	3294840	49	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	14	0.55	517	49.3	57.6	53.3	15.8		28
358	Senthil Kumar K M	3295378	41	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Lens changes	18	0.7	486	47.4	53.5	55.2	18.8	0.88	19
359	Senthil Kumar K M	3295378	41	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Lens changes	18	0.5	470	47.7	58.9	55.4	22		21
360	Ramakrishnan	3274263	62	Male	POAG Suspect	RE	No	No	No	No	6/36	6/6	Clear	16	0.6	527	54.4	67.7	60.8	23.2	0.95	18
361	Ramakrishnan	3274263	62	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	Clear	16	0.5	525	52.5	63.6	60.5	22.6		20

362	Aabu Ezhil	56913	43	Female	POAG Suspect	RE	Yes	Yes	No	No	6/6	6/6	Clear	20	0.65	567	50.4	56.8	58.7	18.6	0.93	22
363	Aabu Ezhil	56913	43	Female	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	20	0.5	568	56.9	69.7	68.9	27.3		25
364	Vijaya	3281605	51	Female	POAG Suspect	RE	No	No	No	No	6/60	6/6	Clear	14	0.65	501	49.3	62.6	52.7	19.7	0.96	22
365	Vijaya	3281605	51	Female	POAG Suspect	LE	No	No	No	No	6/24	6/6	Clear	12	0.75	496	47.8	59.5	53.5	22.4		22
366	Senthamil Selvi V	3297459	50	Female	POAG	RE	No	No	No	Yes	6/6	6/6	Lens changes	18	0.71	579	46.2	52.9	59.3	25.7	0.96	31
367	Senthamil Selvi V	3297459	50	Female	POAG	LE	No	No	No	No	6/6	6/6	Lens changes	18	0.7	578	48.9	54.8	64.3	27		25
368	Chandramohanan	3298570	54	Male	POAG Suspect	RE	No	No	No	Yes	6/9	6/6	Clear	18	0.6	564	49.7	61.8	55.6	18.6	0.59	25
369	Chandramohanan	3298570	54	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	19	0.6	562	47.1	50.6	64.6	20.1		32
370	Sulai Muthu A	3298175	60	Male	POAG	RE	No	No	Yes	No	6/12	6/6	Clear	12	0.6	535	40.5	39.6	44.4	11.8	0.85	61
371	Sulai Muthu A	3298175	60	Male	POAG	LE	No	No	No	No	6/18	6/12	Clear	12	0.5	535	42.9	45.6	47.5	15		40
372	Srinivasan G	3299995	63	Male	POAG	RE	No	Yes	No	No	6/18	6/6	Clear	12	0.65	535	45.8	47.9	59.7	20.8	0.98	49
373	Srinivasan G	3299995	63	Male	POAG	LE	No	No	No	No	6/18	6/6	Clear	14	0.65	551	55	67.1	65.5	30.7		16
374	Sharma	3268312	55	Male	POAG	RE	No	No	No	Yes	5/60	6/9	Clear	14	0.875	543	47.1	54	57.7	17.7	0.91	34
375	Sharma	3268312	55	Male	POAG	LE	No	No	No	No	6/12	6/6	Clear	16	0.85	544	37.2	42.9	44.8	15.3		62
376	Alexander D	3302179	43	Male	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	22	0.65	586	50	57.5	57.9	18.4	0.72	21
377	Alexander D	3302179	43	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	16	0.75	600	54.7	63.7	64.4	22.7		20
378	aroja Ramanathan	3264391	60	Female	POAG Suspect	RE	No	No	No	Yes	6/18	6/6	Clear	16	0.6	470	48.2	62.1	58.3	20.9	0.9	26
379	aroja Ramanathan	3264391	60	Female	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	16	0.65	470	50.9	62.2	59	19.4		24
380	Aisha Mahmood	3302049	53	Female	POAG	RE	No	No	No	Yes	6/6	6/6	Clear	16	0.75	502	44.6	46.7	59.7	21	0.79	40
381	Aisha Mahmood	3302049	53	Female	POAG	LE	No	No	No	No	6/6	6/6	Clear	26	0.8	502	40	45.4	47.4	16.2		53
382	Kannan	3303219	41	Male	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	24	0.5	535	54.9	71.6	65.5	27.9	0.9	17
383	Kannan	3303219	41	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	21	0.5	551	55.4	64.3	73.1	28.5		17
384	Chellamuthu	3301889	42	Male	POAG	RE	No	No	No	No	6/6	6/6	Clear	16	0.65	579	60.3	63.8	68.4	15.2	0.75	19
385	Chellamuthu	3301889	42	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	16	0.5	579	52.8	59.8	52.6	14.5		22
386	Chellamal	3272656	66	Female	POAG	RE	No	No	Yes	No	6/12	6/9	Lens changes	12	0.8	578	43.5	51.5	47.6	12.5	0.76	39
387	Chellamal	3272656	66	Female	POAG	LE	No	No	No	No	6/12	6/6	Lens changes	14	0.8	535	42.9	59.4	40.8	16.9		33
388	Dhanasekaran	3306357	50	Male	POAG	RE	Yes	No	No	No	6/36	6/6	Clear	16	0.8	514	43.4	51.4	48.3	16.6	0.88	29
389	Dhanasekaran	3306357	50	Male	POAG	LE	No	No	No	No	6/60	6/6	Clear	16	0.8	502	42.6	52.4	49.7	16.9		32
390	Sadiq Ali N	3293749	42	Male	POAG	RE	No	No	No	Yes	6/6	6/6	Clear	20	0.7	589	59.6	57.5	64.3	20.2	0.53	14
391	Sadiq Ali N	3293749	42	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	22	0.6	589	54.4	62	65.3	22.6		16
392	Soundammal	3286608	62	Female	POAG Suspect	RE	No	No	No	No	6/36	6/6	Clear	22	0.7	584	54.9	60.8	68.1	24.5	0.75	19
393	Soundammal	3286608	62	Female	POAG Suspect	LE	No	No	No	No	6/60	6/6	Clear	28	0.7	594	53.9	58.5	73.4	26.2		22
394	Simeon Paulraj	3331675	63	Male	POAG	RE	No	Yes	No	Yes	6/60	6/6	Lens changes	15	0.7	531	52.7	64.2	54.2	16.5	0.53	16
395	Simeon Paulraj	3331675	63	Male	POAG	LE	No	No	No	No	6/36	6/6	Lens changes	18	0.6	535	51.8	51.2	54.8	11.6		25
396	Suguna	3278109	53	Female	POAG Suspect	RE	No	No	No	No	6/12	6/6	Clear	20	0.55	549	47.4	53.1	56.5	22	0.89	31
397	Suguna	3278109	53	Female	POAG Suspect	LE	No	No	No	No	6/12	6/6	Clear	16	0.5	551	50.7	61.6	61.2	26.9		21
398	Sambath Kumar	3318024	50	Male	POAG	RE	No	No	No	No	6/6	6/6	Lens changes	20	0.9	551	34.9	37.5	39.2	10.3	0.74	74

399	Sambath Kumar	3318024	50	Male	POAG	LE	No	No	No	No	6/6	6/6	Lens changes	16	0.8	568	41.5	44.7	47.1	16.7		47
400	Kanagaraj	3305268	38	Male	POAG	RE	No	No	No	Yes	6/9	6/6	Lens changes	34	0.4	535	53.9	69.3	56	23.5	0.05	14
401	Kanagaraj	3305268	38	Male	POAG	LE	No	No	No	No	6/6	6/6	Lens changes	42	0.6	535	44.6	49.2	45	14.2		40
402	Nagarajan	3310007	38	Male	POAG	RE	No	No	No	No	6/12	6/6	Lens changes	20	0.9	502	25.7	29.1	21.5	6.1	0.07	98
403	Nagarajan	3310007	38	Male	POAG	LE	No	No	No	No	6/6	6/6	Lens changes	20	0.85	502	34.9	40.1	39.2	12.1		59
404	Josephine Fathima	3310249	61	Female	POAG Suspect	RE	Yes	No	No	No	6/24	6/6	Clear	14	0.5	502	52.4	60.8	59	21.1	0.9	20
405	Josephine Fathima	3310249	61	Female	POAG Suspect	LE	No	No	No	No	6/24	6/6	Clear	15	0.65	519	52.4	59	61.6	22.5		26
406	Sornambika	3310469	68	Female	POAG Suspect	RE	No	No	No	Yes	6/12	6/9	Clear	18	0.6	486	47.1	54.4	45.2	9.8	0.11	42
407	Sornambika	3310469	68	Female	POAG Suspect	LE	No	No	No	No	6/12	6/9	Clear	18	0.7	486	40.8	35.2	51.1	10.1		66
408	Mohan	3303242	59	Male	POAG	RE	No	No	No	No	6/9	6/6	PCIOL	22	0.65	557	59.5	70.3	67	18.7	0.7	21
409	Mohan	3303242	59	Male	POAG	LE	No	No	No	No	6/18	6/18	IMC	20	0.75	557	76	88.2	21.8	21		2
410	Usha	3315024	58	Female	POAG	RE	No	No	No	Yes	2/60	6/9	Lens changes	13	0.8	485	37.3	33.2	43.2	9.1	0.45	64
411	Usha	3315024	58	Female	POAG	LE	No	No	No	No	2/60	6/6	Lens changes	16	0.8	478	46	47.5	49.8	9.7		44
412	Deepak R	3315124	20	Male	POAG Suspect	RE	No	No	No	No	6/24	6/6	Clear	12	0.75	555	49.7	53.2	59.7	18.2	0.76	20
413	Deepak R	3315124	20	Male	POAG Suspect	LE	No	No	No	No	6/24	6/6	Clear	12	0.75	551	51.8	54	68.6	21.4		25
414	Thulsidas	3316136	57	Male	POAG Suspect	RE	No	No	Yes	No	6/6	6/6	Clear	19	0.7	662	50	62.3	50.1	21.3	0.95	17
415	Thulsidas	3316136	57	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	19	0.75	642	53	72	52	22.9		16
416	Annama John	3316110	70	Female	POAG Suspect	RE	No	No	No	Yes	6/60	6/9	Lens changes	20	0.5	649	58.1	56.3	68.9	17.3	0.84	35
417	Annama John	3316110	70	Female	POAG Suspect	LE	No	No	No	No	6/36	6/6	Lens changes	19	0.5	649	64.3	71	76.5	22.7		26
418	Joily Narghes	3316196	50	Male	POAG Suspect	RE	No	No	No	No	6/60	6/12	IMC	14	0.65	570	64.6	79.8	55.8	33.1	0.37	2
419	Joily Narghes	3316196	50	Male	POAG Suspect	LE	No	No	No	No	6/36	6/9	IMC	16	0.65	584	59.2	69	63.5	18.4		17
420	Hareel Rahuman	3292718	56	Male	POAG Suspect	RE	No	No	No	No	6/12	6/6	Clear	15	0.7	557	54.7	64.7	66	20	0.91	15
421	Hareel Rahuman	3292718	56	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	Clear	14	0.8	557	58	62.4	74	20.1		19
422	Krishnaiah	3318099	49	Male	POAG Suspect	RE	No	No	No	No	6/18	6/6	Clear	12	0.7	470	57.9	69.8	64.7	22.9	0.91	14
423	Krishnaiah	3318099	49	Male	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	13	0.7	470	61.9	82	67	30.2		4
424	Lathifa S	3288357	56	Female	POAG Suspect	RE	Yes	No	No	No	6/24	6/6	Clear	14	0.6	551	54.4	63	63.3	21.3	0.43	20
425	Lathifa S	3288357	56	Female	POAG Suspect	LE	No	No	No	No	6/36	6/6	Clear	14	0.7	551	79.7	78.9	81.7	38.4		2
426	Venkatasamy	3238189	59	Male	POAG	RE	No	No	No	Yes	6/9	6/6	Clear	18	0.8	532	57	59.1	66.3	15.7	0.62	26
427	Venkatasamy	3238189	59	Male	POAG	LE	No	No	No	No	6/9	6/6	Clear	14	0.75	534	60.9	70.1	66.1	22.8		11
428	Narayani A	3226737	60	Female	POAG	RE	No	No	No	Yes	6/12	6/6	PCIOL	18	0.9	486	47.9	64	47.6	18.6	0.71	27
429	Narayani A	3226737	60	Female	POAG	LE	No	No	No	No	6/9	6/6	Lens changes	20	0.8	502	48.8	54.3	60.2	21.8		28
430	Sivakami	3222997	55	Female	POAG Suspect	RE	No	No	No	Yes	6/18	6/9	Clear	18	0.8	535	46	50.3	56	17	0.83	32
431	Sivakami	3222997	55	Female	POAG Suspect	LE	No	No	No	No	6/12	6/9	Clear	14	0.8	557	48.1	53.7	65.9	24.5		27
432	Chandrakumar	3203947	51	Male	POAG	RE	No	No	No	No	6/36	6/6	Clear	19	0.7	536	51.2	53.5	62.7	19.3	0.88	24
433	Chandrakumar	3203947	51	Male	POAG	LE	No	No	No	No	6/36	6/6	Clear	20	0.6	526	53.6	62.1	66.8	24.5		18
434	Subramanian	3135830	61	Male	POAG	RE	No	No	No	No	6/60	6/9	Lens changes	19	0.7	486	46.5	59.9	43.2	19.2	0.88	27
435	Subramanian	3135830	61	Male	POAG	LE	No	No	No	No	5/60	6/9	Lens changes	16	0.6	502	49.4	64.2	47.3	18.8		22

436	Ganesh Lal	3123793	30	Male	POAG	LE	No	No	No	No	6/18	6/6	Lens changes	16	0.7	561	63.6	71.3	62.8	21.1		12
437	Ganesh Lal	3123793	30	Male	POAG	RE	No	No	Yes	Yes	6/24	6/6	Lens changes	16	0.75	581	65.3	67.8	75.2	17.7	0.83	15
438	Subramanian	3121626	59	Male	POAG Suspect	RE	No	No	No	No	6/9	6/9	Lens changes	17	0.6	486	49.8	56.1	55	14.1	0.87	29
439	Subramanian	3121626	59	Male	POAG Suspect	LE	No	No	No	No	6/12	6/9	Lens changes	14	0.75	502	50.8	59.2	55.1	20.2		26
440	Anand.J	1616599	33	Male	POAG	RE	No	No	No	Yes	6/9	6/12	Clear	12	0.9	519	25	24.1	29.8	6.8	0.71	98
441	Anand.J	1616599	33	Male	POAG	LE	No	No	No	No	6/6	6/9	Clear	15	0.85	519	25.1	24.1	31.9	10		98
442	Perumal	1784857	61	Male	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	20	0.8	549	43.4	51.4	42.8	15.3	0.9	35
443	Perumal	1784857	61	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	20	0.81	549	45.5	57.4	50.8	23		29
444	Chinnapan	1797159	70	Male	POAG	RE	No	No	No	No	6/9	6/9	Clear	14	0.7	519	68.5	68	55	20.7	0.57	4
445	Chinnapan	1797159	70	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	14	0.7	535	60	65.7	73.5	25.1		18
446	Surendran.m	1854787	68	Male	POAG Suspect	RE	No	No	No	Yes	6/9	6/6	PCIOL	13	0.9	486	57.1	43.7	81	23.1	0.9	36
447	Surendran.m	1854787	68	Male	POAG Suspect	LE	No	No	No	No	6/24	6/6	IMC	13	0.8	485	50.5	41.5	71.5	18.4		48
448	Yoosuf ismail	2246745	50	Male	POAG	RE	No	No	No	Yes	6/12p	6/6	Clear	12	0.75	567	46.3	50.1	50	13.7	0.22	28
449	Yoosuf ismail	2246745	50	Male	POAG	LE	No	No	No	No	6/60	6/18	Clear	12	0.95	540	33.8	32.9	35.5	4.5		88
450	Dharmalingam	2255688	56	Male	POAG	RE	No	No	No	No	6/6	6/6	Lens changes	12	0.7	453	58.9	65.8	71.4	24.2	0.93	11
451	Dharmalingam	2255688	56	Male	POAG	LE	No	No	No	No	6/9	6/6	Lens changes	12	0.75	457	55.9	55.5	77.9	29.9		18
452	Saifunisha	2393325	44	Female	POAG Suspect	RE	No	No	No	Yes	6/60	6/6	Clear	19	0.75	588	57.4	67.5	59.4	17.2	0.85	10
453	Saifunisha	2393325	44	Female	POAG Suspect	LE	No	No	No	No	6/60	6/6	Clear	16	0.7	568	63.2	79	71.8	30.5		3
454	Krishnan	2398150	60	Male	POAG	RE	No	No	No	Yes	6/9	6/6	Clear	17	0.7	535	54.1	64.9	49.8	14	0.48	37
455	Krishnan	2398150	60	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	15	0.7	535	45.3	57.5	42.9	15.5		29
456	Valarmathi	2449518	30	Female	POAG Suspect	RE	No	No	No	No	5/60	6/6	Clear	14	0.7	568	57.5	69.4	65.9	20.1	0.89	10
457	Valarmathi	2449518	30	Female	POAG Suspect	LE	No	No	No	No	4/60	6/6	Clear	16	0.7	568	58.3	77.4	75.6	32.5		8
458	Nagoorkani	2524175	69	Male	POAG Suspect	RE	No	No	No	Yes	6/36	6/18	PCIOL	16	0.7	600	53.7	55	61.3	12.2	0.67	24
459	Nagoorkani	2524175	69	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Lens changes	19	0.75	614	58.1	54.4	72.6	20.4		20
460	Vimalapuspha	2532598	67	Female	POAG	RE	No	No	No	No	6/12	6/18	Clear	18	0.85	535	54.8	65.4	62.8	16.9	0.28	21
461	Vimalapuspha	2532598	67	Female	POAG	LE	No	No	No	No	6/6	6/18	Clear	17	0.65	555	60.4	62.6	59.4	7.5		25
462	Jemina esther	2642997	62	Female	POAG	RE	No	No	No	Yes	6/9	6/9	Clear	18	0.75	535	44.1	53.9	48.7	15.6	0.6	29
463	Jemina esther	2642997	62	Female	POAG	LE	No	No	No	No	6/6	6/6	Clear	16	0.75	537	41.4	51	46.2	15.6		44
464	Ibrahim kalifulla	2714914	56	Male	POAG Suspect	RE	No	No	No	Yes	5/60	6/18	Clear	16	0.75	567	39.4	34.8	47	11.9	0.43	55
465	Ibrahim kalifulla	2714914	56	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	13	0.75	562	47.1	50.1	60.2	25.3		27
466	Devaraj	2740607	54	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	20	0.75	535	54.5	62.6	58.6	16.1	0.85	15
467	Devaraj	2740607	54	Male	POAG Suspect	LE	No	No	No	No	6/6	6/12	Clear	18	0.7	519	55.6	65.5	58.8	17.5		17
468	Sekar	1921932	62	Male	POAG	RE	No	No	No	Yes	6/12	6/6	Clear	12	0.85	570	41.2	42.2	43.3	9.1	0.17	51
469	Sekar	1921932	62	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	17	0.7	550	46.5	56.3	50.2	17.2		36
470	Naseer.PM	2124501	60	Male	POAG Suspect	RE	No	No	No	No	6/12	6/9	Lens changes	18	0.7	523	96.8	104.5	69.1	29.5	0.04	2
471	Naseer.PM	2124501	60	Male	POAG Suspect	LE	No	No	No	No	6/12	6/9	Lens changes	19	0.65	519	57.2	68	57.9	20.2		17
472	Sundarambal	2139894	57	Female	POAG	RE	No	No	No	Yes	6/9	6/6	Lens changes	15	0.6	560	60.6	72.3	72.4	26.8	0.36	5

473	Sundarambal	2139894	57	Female	POAG	LE	No	No	No	No	6/18	6/9	Lens changes	14	0.75	564	49.2	53.6	50.8	9.5		46
474	Rangith singh	32069951	29	Male	POAG	RE	No	No	No	Yes	6/6	6/6	Clear	24	0.85	535	56.3	54.3	69.4	17.5	0.36	27
475	Rangith singh	32069951	29	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	18	0.65	551	63	79.9	80.4	33.5		3
476	Jeyanthi	3183167	40	Female	POAG	RE	No	No	No	No	4/60	6/6	Clear	23	0.75	567	42.3	53.9	46.6	16.2	0.87	28
477	Jeyanthi	3183167	40	Female	POAG	LE	No	No	No	No	5/60	6/6	Clear	23	0.8	584	43.2	57	43.8	16.1		30
478	Mary dora misi	3184617	55	Female	POAG Suspect	RE	No	No	No	No	6/36	6/6	Lens changes	12	0.51	562	56.8	67.1	66.2	21	0.95	13
479	Mary dora misi	3184617	55	Female	POAG Suspect	LE	No	No	No	No	6/24	6/6	Lens changes	12	0.45	514	57.9	72.1	66.5	23.9		18
480	Panchavarnam	3436516	62	Female	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	13	0.5	560	59.3	71.4	68	21	0.92	11
481	Panchavarnam	3436516	62	Female	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	13	0.7	600	57.6	67.3	61.3	21.2		16
482	Gandiammal	3205566	60	Female	POAG	RE	No	No	No	No	6/24	6/9	IMC	14	0.9	502	35.1	35.2	34	6.6	0.18	73
483	Gandiammal	3205566	60	Female	POAG	LE	No	No	No	No	6/18	6/6	IMC	14	0.8	502	41.1	45.4	49	11.8		55
484	Saravan kumar	3302731	31	Male	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	20	0.65	535	49.7	58.6	56.9	22	0.82	24
485	Saravan kumar	3302731	31	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	20	0.65	535	47.8	52.9	63.8	24.8		27
486	Jeyachandran	3388599	41	Male	POAG Suspect	RE	No	Yes	Yes	No	6/12	6/6	Clear	20	0.45	551	50.1	52.6	58.7	18.9	0.94	17
487	Jeyachandran	3388599	41	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	Clear	20	0.55	568	46.6	50.4	54.4	17.9		23
488	Subramanian	3391425	45	Male	POAG	RE	No	No	No	Yes	6/6	6/6	Clear	16	0.6	519	52.9	63.2	63.2	22	0.95	25
489	Subramanian	3391425	45	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	12	0.7	512	48.8	57.4	56.2	19.1		33
490	Aravinda.G	3392207	36	Female	POAG	RE	No	No	No	No	6/6	6/6	Clear	18	0.75	503	43.4	50.9	57.1	21.7	0.89	30
491	Aravinda.G	3392207	36	Female	POAG	LE	No	No	No	No	6/6	6/6	Clear	18	0.75	502	43.6	52.2	50.2	18.8		34
492	Syedarthahi	3394079	55	Male	POAG	RE	No	No	No	No	6/6	6/6	Clear	16	0.5	600	47.1	46.1	57.7	14.7	0.33	38
493	Syedarthahi	3394079	55	Male	POAG	LE	No	No	No	No	6/18	6/9	Clear	30	0.5	600	34.1	30.1	41.3	8.2		93
494	Syedibrahim	3385441	53	Male	POAG	RE	No	No	No	Yes	6/60	6/6	Clear	19	0.65	486	53.2	57.5	57.4	14.4	0.29	28
495	Syedibrahim	3385441	53	Male	POAG	LE	No	No	No	No	6/36	6/6	Clear	19	0.75	486	50.8	63.2	58.4	22.5		22
496	Dheenu nisha	3396892	54	Female	POAG	RE	No	Yes	Yes	No	6/18	6/6	Clear	21	0.7	519	50.6	57.6	60.5	17.9	0.86	20
497	Aruldoss	3397021	64	Male	POAG	RE	No	No	No	Yes	6/9p	6/6	Clear	20	0.85	568	42.3	49.3	48.3	15	0.78	45
498	Aruldoss	3397021	64	Male	POAG	LE	No	No	No	No	6/12	6/6	Clear	22	0.75	558	37.7	38.3	50.7	14.3		72
499	Jeyamarry	3395008	42	Female	POAG	RE	No	No	No	Yes	6/9	6/6	Clear	18	0.8	551	39.3	50.7	41.5	17.5	0.89	61
500	Jeyamarry	3395008	42	Female	POAG	LE	No	No	No	No	6/9	6/6	Clear	17	0.8	549	38.9	46	42.8	19		60
501	Vasantha	3204849	58	Female	POAG Suspect	RE	No	No	No	No	6/60	6/12	Lens changes	15	0.8	553	51	50.5	55.9	11.4	0.23	23
502	Vasantha	3204849	58	Female	POAG Suspect	LE	No	No	No	No	6/24	6/9	Lens changes	15	0.8	535	51.9	62.9	52.8	14.3		23
503	Kadarmoideen	3204260	55	Male	POAG Suspect	RE	No	Yes	Yes	No	6/12	6/6	IMC	22	0.55	567	42.5	49.5	54.3	19.3	0.82	36
504	Kadarmoideen	3204260	55	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	IMC	23	0.65	584	35.6	37.3	44.5	11.2		67
505	Navaneethavel	3203204	21	Male	POAG	RE	No	No	No	Yes	6/6	6/6	Clear	24	0.75	584	38.7	44.2	44	12.4	0.84	56
506	Navaneethavel	3203204	21	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	20	0.6	584	44.2	52.3	57.6	22.8		34
507	Muthu	3202999	28	Male	POAG	RE	No	No	No	No	6/6	6/6	Clear	20	0.75	567	43.5	52.5	48.8	19.6	0.82	29
508	Muthu	3202999	28	Male	POAG	LE	No	No	No	No	6/6	6/6	Clear	20	0.75	558	47.6	54.1	59.8	24.3		32
509	Ramathal	3377269	53	Female	POAG	RE	No	No	No	No	5/60	6/9	Lens changes	12	0.7	595	59	73.5	70	29.7	0.91	15

510	Ramathal	3377269	53	Female	POAG	LE	No	No	No	No	5/60	6/9	Lens changes	12	0.7	565	61.2	74.8	76	27.9		8
511	Manoja	3394875	30	Female	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	15	0.7	569	45.8	55.1	56.4	19.8	0.97	24
512	Manoja	3394875	30	Female	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	14	0.7	576	46.1	58.5	54.9	20.9		22
513	Sirajunisha	3395708	51	Female	POAG	RE	No	No	No	No	6/6	6/6	Clear	24	0.7	502	45	53.2	46.2	13.4	0.86	35
514	Sirajunisha	3395708	51	Female	POAG	LE	No	No	No	No	6/6	6/6	Clear	24	0.55	506	46.1	57.3	54.8	19.6		26
515	Murugesan	3127808	51	Male	POAG	RE	No	No	No	No	6/9	6/6	Clear	15	0.65	531	40.9	57.5	34.6	20.6	0.89	45
516	Murugesan	3127808	51	Male	POAG	LE	No	No	No	No	6/9	6/6	Clear	17	0.65	535	45.7	61.7	45.8	24.2		34
517	Rathinamal	3200055	60	Female	POAG	RE	No	No	No	No	6/24	6/9	Lens changes	18	0.8	557	42.5	47.2	39.8	12.6	0.69	47
518	Rathinamal	3200055	60	Female	POAG	LE	No	No	No	No	6/24	6/9	Lens changes	14	0.65	555	46.3	59.5	40.9	15.2		30
519	Vinod Viswambaram	2825411	40	Male	POAG Suspect	RE	No	No	No	No	6/36	6/6	Clear	15	0.65	550	50.4	61.5	55.9	18	0.92	18
520	Vinod Viswambaram	2825411	40	Male	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	15	0.6	559	50.6	62.5	62	23.9		16
521	Suseela	2999305	63	Female	POAG	RE	No	No	No	No	6/6	6/6	Lens changes	16	0.7	502	48.1	57.3	58.9	19.4	0.84	22
522	Suseela	2999305	63	Female	POAG	LE	No	No	No	No	6/36	6/12	Lens changes	16	0.7	502	54.7	53.4	76.6	23.9		22
523	Viswanathan	3059283	50	Male	POAG	RE	No	No	No	No	6/18	6/6	Clear	24	0.7	535	51.2	56	58.7	17.3	0.67	27
524	Viswanathan	3059283	50	Male	POAG	LE	No	No	No	No	6/9	6/6	Clear	25	0.7	530	59	68.1	67.3	23.2		11
525	Sornam D	2688151	58	Female	POAG Suspect	RE	No	No	Yes	No	6/24	6/6	Clear	22	0.75	568	52.4	63.9	60.3	19.7	0.9	14
526	Sornam D	2688151	58	Female	POAG Suspect	LE	No	No	No	No	6/24	6/6	Clear	22	0.75	578	49.6	57.4	57.3	17.5		19
527	Koshymanthan	1409099	54	Male	POAG	RE	No	No	No	No	4/60	6/6	Clear	25	0.75	508	43.6	53.4	49.5	15	0.89	45
528	Vasugi K	3197258	45	Female	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	12	0.7	537	56.3	55.1	64.4	24.4	0.93	10
529	Vasugi K	1409099	54	Female	POAG	LE	No	No	No	No	6/6	6/6	Clear	14	0.65	536	57.2	53.9	60.9	23		13
530	Mohamed Ibrahim	3215241	48	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Lens changes	18	0.75	535	51.2	61.9	48.5	16.8	0.42	33
531	Mohamed Ibrahim	3197258	45	Male	POAG Suspect	LE	No	No	No	No	2/60	6/18	IMC	18	0.9	535	59.2	63.7	60.9	13.3		36
532	Lalitha M	3216776	55	Female	POAG Suspect	RE	No	No	No	No	6/18	6/6	Clear	14	0.6	594	49.6	58.7	59.6	22.6	0.91	16
533	Lalitha M	3215241	48	Female	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	16	0.6	594	47.4	57.2	53.8	19.6		21
534	Rachel Vargheese	3215482	60	Female	POAG	RE	No	No	No	No	6/6	6/6	Clear	20	0.75	535	42.2	62.1	37.3	19	0.66	33
535	Rachel Vargheese	3216776	55	Female	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	20	0.6	535	55.8	65.4	72.5	26.5		14
536	Raju	3402276	60	Male	POAG Suspect	RE	No	Yes	No	No	6/6	6/6	Clear	22	0.75	579	46.4	55.1	52	14.6	0.89	35
537	Raju	3215482	60	Male	POAG	LE	No	No	No	No	6/9	6/6	Clear	22	0.8	502	46.3	58.4	50.8	16.4		32
538	Mohamed Aslam	3000113	22	Male	POAG	RE	Yes	No	No	No	6/6	6/6	Clear	22	0.65	601	52.9	59.6	67.1	22.8	0.78	18
539	Mohamed Aslam	3402276	60	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	24	0.65	601	59.4	63.9	81.1	28.2		16
540	Jeyapaul	2132655	55	Male	POAG Suspect	RE	No	No	No	No	6/12	6/6	Clear	17	0.6	535	47.6	56	54.1	17.6	0.93	28
541	Jeyapaul	3000113	22	Male	POAG	LE	No	No	No	No	6/12	6/6	Clear	16	0.5	534	42.7	53.9	48.9	19.1		34
542	Anand	2132655	55	Male	POAG Suspect	LE	No	No	No	No	6/18	6/6	Clear	12	0.95	579	25.1	24.1	31.9	10		98
543	Salim	3398526	46	Male	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	12	0.65	537	47.4	50.9	54.3	20.9	0.91	37
544	Koshymanthan	3398526	46	Male	POAG Suspect	LE	No	No	No	No	4/60	6/6	Clear	25	0.6	512	54.4	65.3	70	22.3		18
545	Muthuraj	3200741	65	Male	POAG	RE	No	No	No	No	6/12	6/6	Clear	20	0.75	563	48.1	49.6	62.1	22.4	0.87	42
546	Muthuraj	3200741	65	Male	POAG	LE	No	No	No	No	6/18	6/6	Clear	20	0.6	553	52.3	63.2	64.7	27.5		23

547	Saraswathy ASM	3202963	56	Female	POAG Suspect	RE	No	No	No	No	6/36	6/9	Lens changes	12	0.75	535	49.4	58	52.2	15.6	0.45	24
548	Saraswathy ASM	3202963	56	Female	POAG Suspect	LE	No	No	No	No	6/60	6/12	Lens changes	12	0.65	535	52.7	58.6	52.8	14.1		26
549	Ahamed Hadya T	3211666	55	Female	POAG Suspect	RE	No	Yes	No	No	6/9	6/6	Clear	18	0.6	552	40.3	44.3	46.9	14.7	0.82	51
550	Ahamed Hadya T	3211666	55	Female	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	16	0.65	542	39.9	42.1	47.3	17.4		54
551	Johnson	3352339	59	Male	POAG	RE	No	No	No	No	6/9	6/6	Clear	16	0.75	486	42.1	48.3	48.3	12.8	0.74	49
552	Johnson	3352339	59	Male	POAG	LE	No	No	No	No	6/9	6/6	Clear	16	0.8	480	34.3	37.9	40.2	13		67
553	Jacintha Levenia H	3400190	49	Female	POAG	RE	No	No	No	No	6/12	6/6	Clear	20	0.65	519	46.3	45.2	55.3	12.4	0.63	44
554	Jacintha Levenia H	3400190	49	Female	POAG	LE	No	No	No	No	6/12	6/6	Clear	18	0.5	535	50.1	56.2	63.6	19.3		25
555	Rosemma Joseph	3402187	60	Female	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	16	0.7	549	44.3	54.9	45.9	15.3	0.39	39
556	Rosemma Joseph	3402187	60	Female	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	16	0.8	541	45.9	57.7	53.1	20.7		25
557	Tripathi	3385793	45	Male	POAG	LE	No	No	No	No	6/12	6/6	PCIOL	14	0.6	519	65.8	73.4	72.7	23.6		20
558	Leelamma John	3385815	66	Female	POAG Suspect	RE	No	Yes	Yes	No	6/24	6/6	IMC	12	0.6	582	61.7	81.1	64.5	28.7	0.71	4
559	Leelamma John	3385815	66	Female	POAG Suspect	LE	No	No	No	No	6/24	6/12	IMC	12	0.7	582	60.4	73.7	72.9	26.8		6
560	Vineeutrani	3384679	67	Male	POAG	RE	No	No	Yes	No	5/60	6/6	Lens changes	13	0.7	502	62.1	64.4	68.1	16.6	0.21	9
561	Vineeutrani	3384679	67	Male	POAG	LE	No	No	No	No	5/60	6/6	Lens changes	12	0.75	519	49.8	55	38.3	13.6		25
562	Chandrasekar	3383785	64	Male	POAG Suspect	RE	No	Yes	No	No	6/12	6/12	Clear	18	0.7	584	53.3	63.9	57.4	17.4	0.8	26
563	Chandrasekar	3383785	64	Male	POAG Suspect	LE	No	No	No	No	6/6	6/6	Clear	18	0.75	584	53.2	59.1	69.7	22.9		26
564	Somasundaram	2077172	36	Male	POAG Suspect	RE	No	No	No	No	6/60	6/6	Clear	18	0.8	569	44.6	57.3	50.3	15	0.69	43
565	Somasundaram	2077172	36	Male	POAG Suspect	LE	No	No	No	No	6/60	6/6	Clear	18	0.7	566	45.3	53.4	42.6	10.6		45
566	Mohamed Kasim	3069699	43	Male	POAG Suspect	RE	No	No	No	No	6/12	6/6	Clear	16	0.8	502	51.8	61.3	59.9	19.6	0.93	20
567	Mohamed Kasim	3069699	43	Male	POAG Suspect	LE	No	No	No	No	6/12	6/6	Clear	16	0.8	486	50.5	62.8	57.6	19.5		21
568	Mumtaj Begum	3108996	47	Female	POAG	RE	No	No	No	No	6/9	6/6	Clear	13	0.7	534	59.6	75.4	68.3	21	0.89	5
569	Mumtaj Begum	3108996	47	Female	POAG	LE	No	No	No	No	6/9	6/6	Clear	13	0.6	578	57.6	71	69	24.6		8
570	Allapitchai	3150577	42	Male	POAG	RE	No	No	No	No	6/6	6/6	Lens changes	21	0.7	628	50.1	52.7	54	10.2	0.76	43
571	Allapitchai	3150577	42	Male	POAG	LE	No	No	No	No	6/6	6/6	Lens changes	21	0.8	616	44.6	45.7	52.9	14.4		63
572	Jegan	3178086	20	Male	POAG Suspect	RE	Yes	No	No	No	5/60	6/6	Clear	12	0.7	519	43.4	55.6	49.4	16.6	0.8	28
573	Jegan	3178086	20	Male	POAG Suspect	LE	No	No	No	No	5/60	6/6	Clear	12	0.5	502	49.4	63.9	55.2	22.5		24
574	Rahmath Beevi	3182070	42	Male	POAG	RE	No	No	No	No	3/60	6/9	Clear	26	0.75	554	58.6	61.4	63.2	13.9	0.32	21
575	Rahmath Beevi	3182070	42	Male	POAG	LE	No	No	No	No	3/60	6/9	Clear	26	0.75	550	50.4	56.3	58.5	10.5		49
576	Kuppamal S	2999699	66	Female	POAG Suspect	RE	No	No	No	No	6/6	6/6	PCIOL	14	0.6	502	59	60	74.4	20.9	0.92	26
577	Kuppamal S	2999699	66	Female	POAG Suspect	LE	No	No	No	No	6/36	6/12	PCIOL	12	0.65	502	61.9	69.2	78.6	26		21
578	Shanthi K	2876965	55	Female	POAG Suspect	RE	No	No	No	No	6/6	6/6	Clear	14	0.7	568	66.8	81.5	70.8	22.8	0.74	14
579	Shanthi K	2876965	55	Female	POAG Suspect	LE	No	No	No	No	6/12	6/6	Clear	14	0.65	535	60.4	71.9	75.2	31.1		13
580	Gopinath	1747155	22	Male	POAG	RE	No	No	No	No	6/6	6/6	Clear	14	0.6	502	47.1	62.1	39.7	16.7	0.07	26
581	Gopinath	1747155	22	Male	POAG	LE	No	No	No	No	6/18	6/9	Clear	14	0.9	502	56.2	54.3	60.9	16.9		13
582	Menaksi sundram	3448170	62	Male	POAG	RE	No	No	No	No	6/9	6/6	Lens changes	18	0.75	486	56.1	64	67.1	22.2	0.9	15
583	Menaksi sundram	3448170	62	Male	POAG	LE	No	No	No	No	6/12	6/6	Lens changes	17	0.65	481	61.3	70.6	71.7	22		16

584	Samitha S	3261814	22	Female	POAG Suspect	RE	Yes	No	No	No	4/60	6/6	Clear	16	0.75	551	51.4	60.8	56.2	56.2	0.81	21
585	Samitha S	3261814	22	Female	POAG Suspect	LE	No	No	No	No	3/60	6/6	Clear	15	0.75	556	51.6	62.9	61	19.8		23
586	Suresh	3447512	63	Male	POAG	RE	No	No	No	No	6/12	6/6	Lens changes	14	0.85	607	45.3	60.3	37.3	15.2	0.65	28
587	Suresh	3447512	63	Male	POAG	LE	No	No	No	No	6/9	6/6	Lens changes	12	0.75	631	55.4	71.3	60.4	21		14
588	Susheela Nair	2291375	62	Female	POAG	RE	No	No	Yes	No	6/12	6/6	PCIOL	14	0.65	502	50.5	56.2	58.2	15	0.82	30
589	Susheela Nair	2291375	62	Female	POAG	LE	No	No	No	No	6/12	6/6	PCIOL	12	0.65	505	55.6	62.1	63.2	13.1		31
590	Madhavan	1981258	69	Male	POAG Suspect	RE	No	Yes	No	No	6/36	6/12	PCIOL	19	0.55	584	61.2	64.9	67.3	16.3	0.8	25
591	Madhavan	1981258	69	Male	POAG Suspect	LE	No	No	No	No	6/36	6/6	PCIOL	19	0.65	584	68.8	71.9	84.4	21.6		19
592	Arul E G	2592980	42	Male	POAG	RE	No	No	No	No	6/9	6/6	Clear	17	0.65	518	54.9	58.8	67.8	18.4	0.9	22
593	Arul E G	2592980	42	Male	POAG	LE	No	No	No	No	6/9	6/6	Clear	21	0.65	502	65.1	77.6	79.5	31.4		2
594	Shenbagarajan	2014088	65	Male	POAG Suspect	RE	No	No	No	No	5/60	6/6	Clear	22	0.55	522	53.3	62.6	65.4	25	0.97	19
595	Shenbagarajan	2014088	65	Male	POAG Suspect	LE	No	No	No	No	4/60	6/6	Clear	22	0.5	543	52.2	62.6	65.5	24.2		18
596	Omana B	1984613	50	Female	POAG Suspect	RE	No	No	No	No	6/18	6/6	Clear	12	0.75	457	49.2	59.1	46.1	22.5	0.87	21
597	Omana B	1984613	50	Female	POAG Suspect	LE	No	No	No	No	6/12	6/6	Clear	12	0.65	453	51.1	64.1	55.5	25.7		21
598	Ayesha Beevi	1788355	57	Female	POAG Suspect	RE	No	No	No	No	6/9	6/6	Clear	15	0.75	502	53.1	64.4	60.6	20.4	0.82	17
599	Ayesha Beevi	1788355	57	Female	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	15	0.65	535	53.7	66.1	67.9	26.5		16
600	Shanthi ammal	3428692	41	Female	POAG	RE	No	No	No	No	6/6	6/6	Clear	16	0.75	502	40	44.9	52	17.5	0.86	48
601	Shanthi ammal	3428692	41	Female	POAG	LE	No	No	No	No	6/6	6/6	Clear	14	0.7	505	48.3	60.5	61	25.6		24
602	Arokiaraj	2201957	49	Male	POAG Suspect	RE	No	No	No	No	6/12	6/6	Clear	16	0.75	571	50.1	57	52.4	15	0.78	21
603	Arokiaraj	2201957	49	Male	POAG Suspect	LE	No	No	No	No	6/9	6/6	Clear	16	0.65	502	47.1	55	57.5	21		25